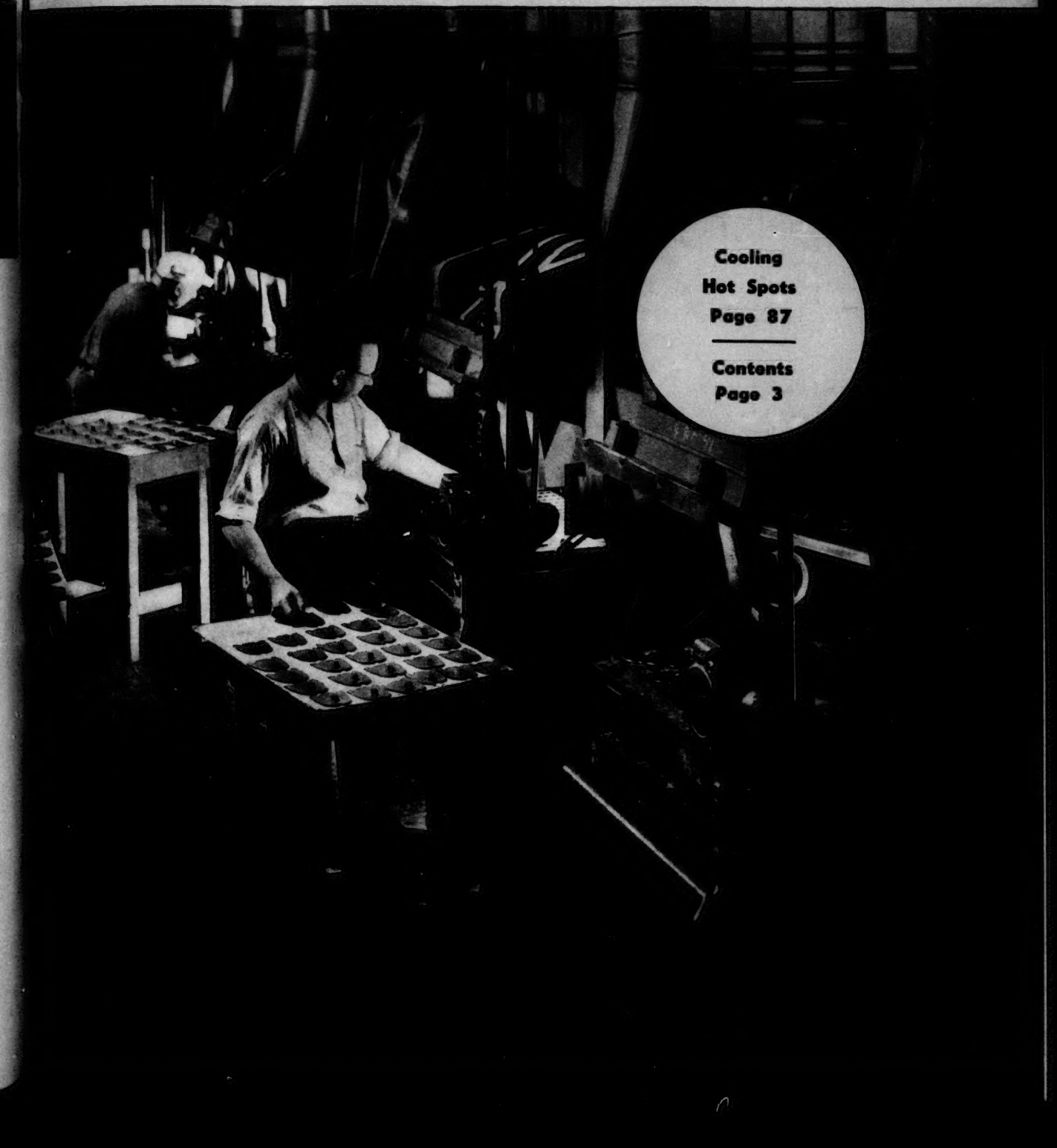
SEPTEMBER, 1954

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



Cooling Hot Spots Page 87

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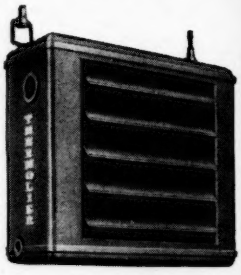
HEAT

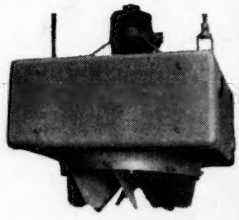
where you want it
when you want it
whatever the fuel you use

GRINNELL UNIT HEATERS

Horizontal Gas-Fired Model for natural, manufactured, mixed and LP Gases.



Horizontal Model for steam and hot water systems.



Vertical Model for steam and hot water systems.

Grinnell quality is well known. The "Grinnell" name is backed by over 60 years of heating experience. Regardless of the type and model you choose, you can depend on a Grinnell Unit Heater to give balanced heating performance plus maximum fuel economy. Call on Grinnell . . . for the unit heater to meet your specific needs.

GRINNELL
Gas-Fired Unit Heater

Available in 7 sizes — ranging from 25,000 to 200,000 Btu per hour input

Grinnell Gas-Fired Unit Heaters are easy to install, simple to operate and maintain. Efficient performance is assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit. Automatic safety pilot operates to shut off main gas supply if pilot goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. American Gas Association approved.

GRINNELL THERMOLIER
Steam/Hot Water Unit Heater

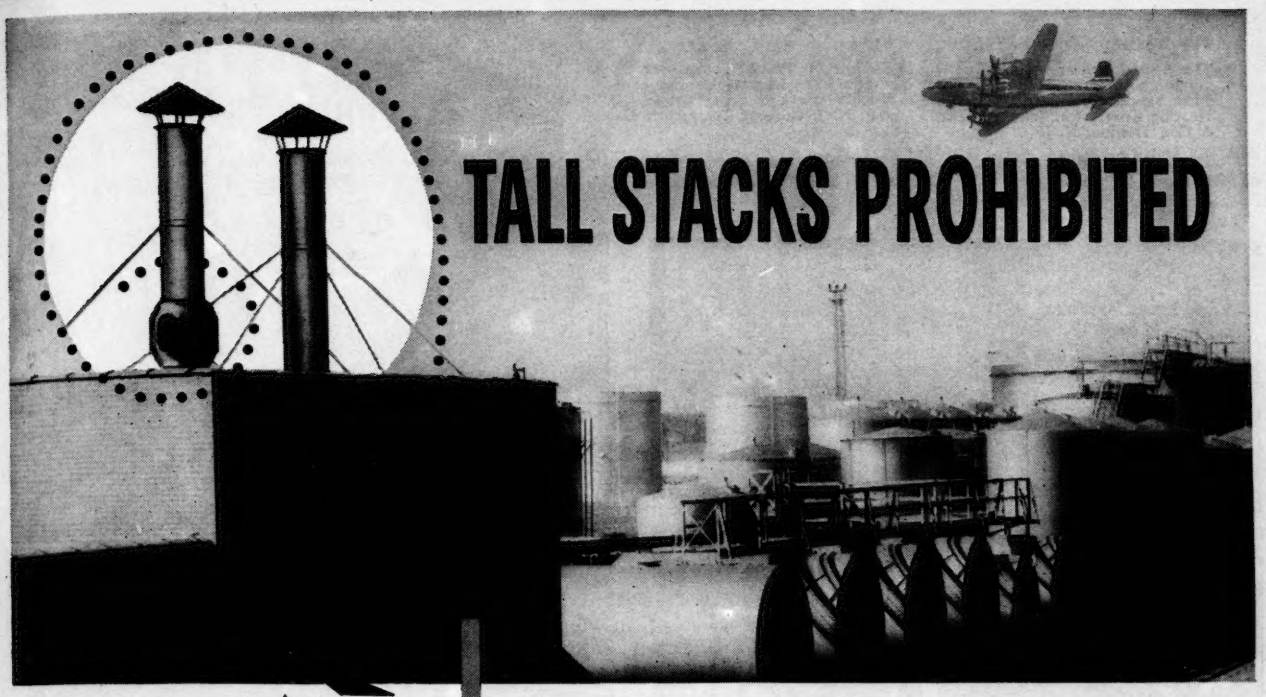
4 models . . . 18 sizes — from 35,600 to 275,300 total heat delivered, Btu per hour

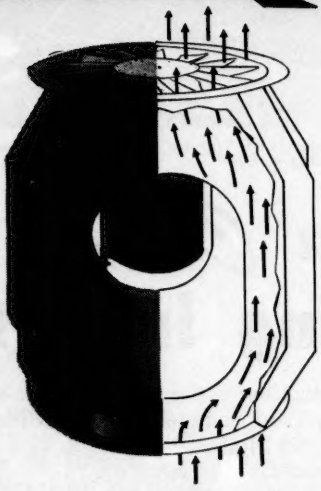
Three basic models—horizontal, vertical and a special horizontal Textile model. (Adjustable velocity nozzle also available for use on horizontal models.) All models have plain thermostatic trap, the simplest and least expensive kind of a trap, made practical because of unit's exclusive internal cooling leg; maximum capacity provided and destructive water hammer eliminated by built-in pitch of tubes. Many other important features.

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems



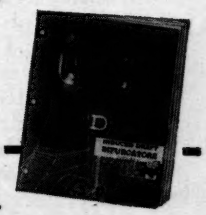


The Induced Draft Bifurcator is a motor-driven axial-flow fan in a divided housing. Motor is in an isolated chamber around which flue gases are by-passed so that motor always remains clean, accessible and at safe temperature. Induced Draft Bifurcators are built in 24 sizes, for high-pressure boilers delivering up to 60,000 pounds of steam per hour and for low-pressure boilers rated up to 190,000 EDR.

So Socony-Vacuum Lubricating Oil Plant insures boiler draft with Induced Draft Bifurcator Fans

This Socony-Vacuum oil blending and packaging plant is located near the Kansas City Airport, so they couldn't erect a tall stack for boiler draft. This restriction posed a problem because the plant requires two 150 HP boilers to provide steam for plant processes, tank car cleaning and barrel cleaning.

Socony-Vacuum engineers solved the problem by installing two Induced Draft Bifurcator Fans. One Induced Draft Bifurcator Fan is mounted in the breeching immediately above the boiler. The other Bifurcator is mounted on the roof because of limited space above boiler smoke outlet. These units provide adequate draft for the two 150 HP boilers — and they require only 12-foot steel stub stacks.



For full information on Induced Draft Bifurcators, simply **MAIL COUPON TODAY.**

DeBothezat Fans

Division of

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. HV-954, East Moline, Illinois

Please send free Bulletin DB-32-52 with full technical data on Induced Draft Bifurcators.

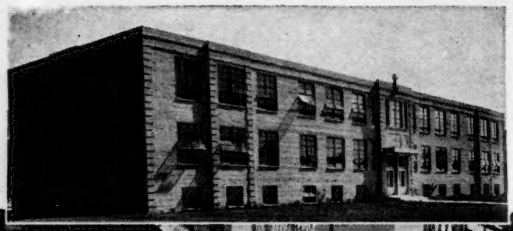
FIRM NAME _____

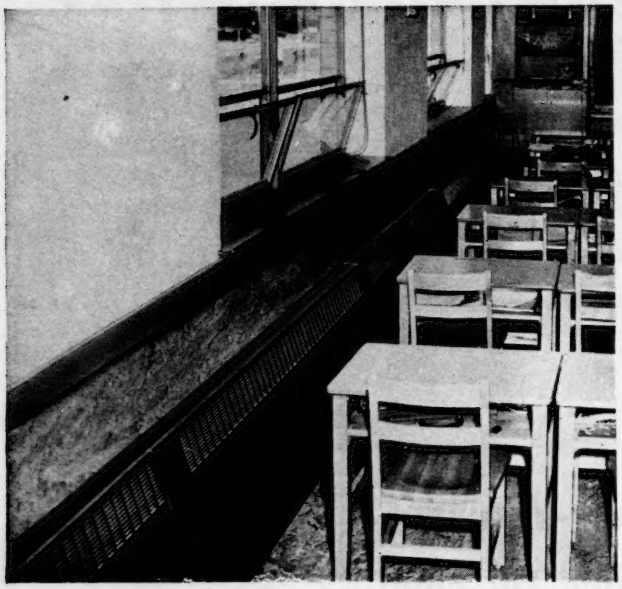
ADDRESS _____

CITY _____ ZONE _____ STATE _____

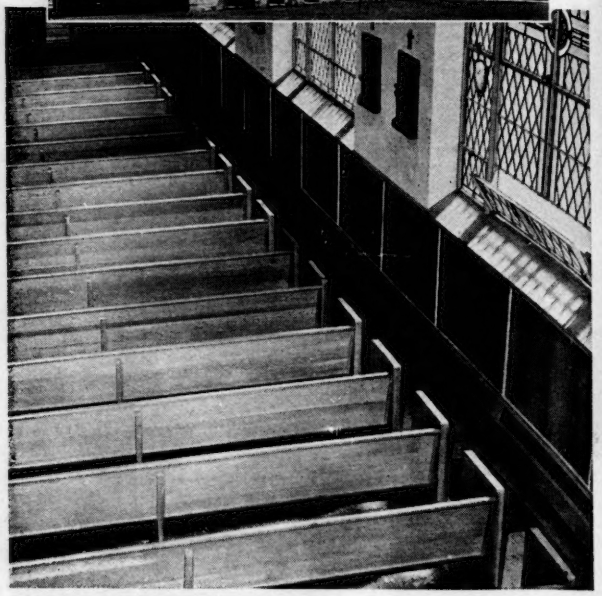
NAME AND TITLE _____

This new church-and-school building of St. Joseph's Parish, Toms River, N. J. combines economy in initial cost with quality in every important design feature. Floor space, 40,894 sq. ft. Architects: Wm. W. Slack & Son, Trenton, N. J. Heating Contractor: John G. Carr, Trenton, N. J. General Contractor: Daley & Co., Trenton, N. J.





In classrooms, Webster Walvector, installed along exposed walls, provides warmth where heat loss occurs, eliminates down-drafts.



Webster Tru-Perimeter Heating with Webster Walvector affords wall-to-wall warmth in the high-ceilinged church.

It's a School *It's a Church* with Tru-Perimeter Heating in Both

Just 8% of total construction cost . . . $41,230 is what it cost to equip this dual purpose building with Webster Tru-Perimeter Heating and Webster Moderator Control.

Completed in 1952 at a cost of $509,240 (excluding land, financial and legal expenses), this new church-and-school building of St. Joseph's Parish, Toms River, N. J., is now accommodating 550 pupils, although its capacity is 800—ample to take care of future needs.

Webster Walvector, as shown in the classroom and church above, is teamed with Webster Moderator Control to provide heating comfort without wasteful overheating. Walvector provides gentle, even warmth where heat loss occurs, and eliminates down drafts. With the Webster Moderator System, a Webster Outdoor Thermostat speeds delivery of heat when outdoor temperature falls, and slows down delivery when outdoor temperature rises. This heating system is always in proper balance—delivers heat in the desired amount for each room or section of the building. Shut off one room or an entire floor and the system automatically compensates for the decreased demand. Webster meets the need for extra heat at the rear of the church and cafeteria, also on corridors and stairs—with Unit Heaters and Webster Convectors.

Whether for modernization or for new construction, get the facts on Tru-Perimeter Heating with Webster Walvector and Moderator Control. Call the Webster Representative, or write us.

Address Dept. HV-9

WARREN WEBSTER & COMPANY

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WEBSTER

MODERATOR

TRADE MARK REG. U.S. PAT. OFF.

SYSTEM

OF STEAM HEATING

"Controlled by the weather"

AND

Other Webster Heating Equipment for institutions includes Tru-Perimeter Heating with Webster Baseboard; Webster Control for Hot Water Heating; Webster Radiator Traps and Valves, Drip Traps and other Steam Heating Specialties for heating and process applications; Unit Heaters.

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, PLUMBING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

September, 1954

VOLUME 51—NO. 9

The Cover: Spot cooling of McNeil rubber presses at Westinghouse Air Brake Co. Outside air is blown directly at operator when press is opened.

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Washington News

LORING F. OVERMAN

OF the dozen pieces of major national legislation enacted by the 83rd Congress, one will affect every person in the United States; several will be of particular interest to the heating, ventilating and air-conditioning industries, and still others will have more limited application.

The single bill affecting all is the tax revision bill (H. R. 8300), which now becomes the Internal Revenue Code of 1954. Its 1,000 pages of changes represent the first overall revision of tax law in 75 years. Sponsors contend that it provides business with needed stimulants; that it corrects inequities, and provides needed relief for individuals. Of that, more later.

Other legislation having particular significance for readers of this column are the following:

(1) The Housing Bill (H. R. 7839), which extends FHA authority to guarantee home mortgages; cuts public housing sharply, and places new restrictions on rental housing construction of the type responsible for windfall profit scandals.

(2) The Hospital Construction Bill, authorizes $182 million in hospital construction over a three-year period.

(3) The Atomic Energy Bill, which outlines conditions under which private enterprise may participate in the atomic energy programs. Since this promises to be the next truly big new industry in the country—with investments dwarfing even those of the automobile industry—activity in the field will bear watching.

(4) The Social Security Expansion Bill, providing for larger benefits, higher taxes and broader coverage, promises to affect the present and future of millions.

Still other major bills, each of more or less interest to those who read this column, are:

(1) Excise Tax Bill, which extended expiring excises, but cut levies by nearly $1 billion.

(2) Regular appropriation bills, making available $42.6 billion for fiscal 1955—$1.6 billion less than the $44.2 billion asked.

(3) St. Lawrence Seaway Bill, approving a giant navigation project which has been under discussion for 30 years.

(4) Farm Bill, providing for flexible price supports ranging from 82½% to 90% of parity. This bill is important because it directly affects the income of farmers, thereby risking their political vengeance if things go wrong. How farmers react to this bill may well determine the political makeup of the next Congress, and consequently the atmosphere in which business itself will function.

(5) Highway Construction Bill, authorizing $1.9 billion in federal funds for use in conjunction with matching state appropriations during fiscal '56 and '57. What is done with these highway funds, among others, may determine the location of new communities, and the nature of new commercial, industrial, and recreational facilities in which heating, plumbing and air-condition will play an important part.

(6) At press time for this column, Congress was still toying with the idea of outlawing the Communist party as a political entity. Whether this move would encounter a veto was uncertain, but it serves to highlight the temper of Washington in regard to the Reds and their programs. The action of Congress reaffirms the deadly seriousness with which Washington views the Red problem, and explains some of the steps being taken by the military and the civilian defense agencies.

About Depreciation

Even the tax revision bill, it appears, has been influenced by Washington's acceptance of the premise that business and industry must be encouraged to be ready for defense materials production at a moment's notice.

Perhaps the most significant provision of the new tax bill is the one liberalizing allowances for depreciation of plant equipment. It means that a company may write off the cost of new equipment over a shorter period of time. The provision is expected to encourage business to invest more readily in new plant and equipment, and to scrap old equipment somewhat earlier. Since such investment is one of the major business stimulants, the provision is expected to have a bracing effect during the next few years.

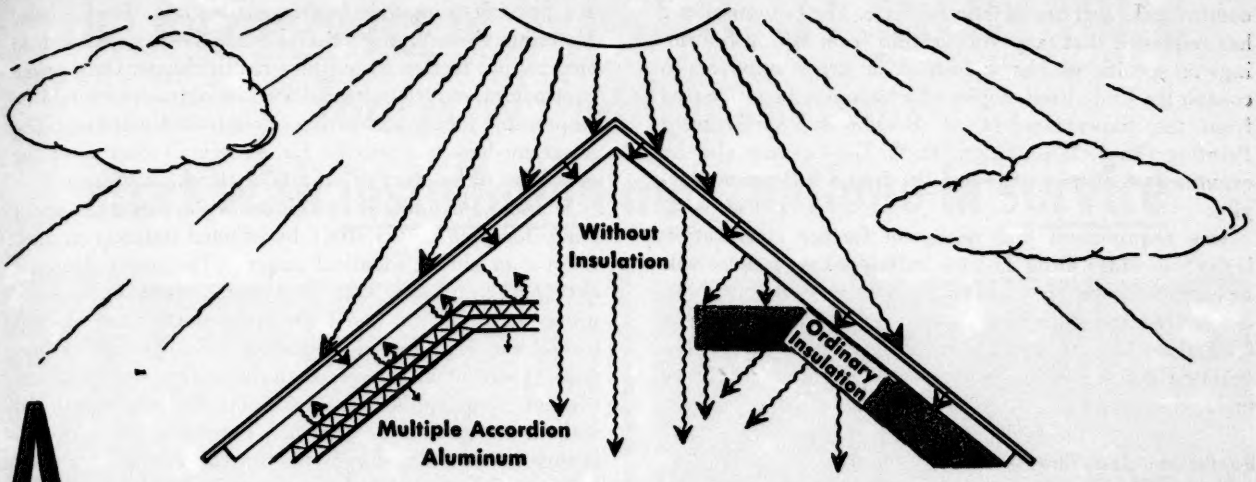
For those who engineer and produce the nation's heating, ventilating, air conditioning and plumbing equipment, the depreciation provision is a double-bladed affair. It will aid them in modernizing their own operations, and will provide the sales inducement for customers to step up their improvement programs.

Important Changes

Fiscal year taxpayers will be the first to feel the effects of the Internal Revenue Code of 1954. Of particular importance to corporations with fiscal years ending after April 1 will be the one-year extension of the 52% corporate income tax rate. That rate was schedule to expire April 1 of 1954, dropping the rate to 47%, but the current tax revision bill extends the 52% rate until April 1, 1955.

The bill also institutes a new procedure for the payment of corporate income taxes. For taxable years beginning after December 31, 1954, corporations with an estimated tax liability in excess of $100,000 will be required to file declarations of estimated tax on the 15th day of the ninth month of their taxable years. With the filing of the declaration payment of 5% of the estimated tax will be required. A second payment of 5% must be made on the 15th day of the twelfth month of the taxable year. These payments of estimated tax will increase 5% each year until 1959, when they will reach 25%.

In addition to changing and clarifying tax provisions for corporations, there are important changes in requirements for partnerships, and for individuals. The Commissioner of Internal Revenue has indicated that it may be months before all of the wrinkles are ironed out of the new tax law. He promises, however, that clarifying regulations will be issued promptly to cover any particularly



An Empty Roof Space Would Be The Best Insulation Against Summer Sun, *Were It Not For Radiation*

But substantially the only summer heat flow through empty roof space is RADIATION. There is slight CONDUCTION. Heat flow by CONDUCTION through any building space is about 7% of the total. CONVECTION is not a problem—there is no CONVECTION downward.

Ordinary insulation may retard heat for a time, but stores a large amount of heat as compared to empty space. More dense, it is a much better conductor of heat than just air and so more heat passes through it by conduction. Its surfaces have a heat ray absorptivity and emissivity of over 90% and radiate heat into the building through the day, and sometimes into the night.

The solution is to use a material which has little substance and whose surfaces will absorb and emit little radiation. Gold or silver foil would be excellent, but tough multiple accordion aluminum, which weighs but ¼ oz. per sq. ft., is inexpensive and almost as good, with a heat ray absorptivity and emissivity of only 3%.

The metal sheets of multiple accordion aluminum are impervious to water vapor and are continuous, 500 ft. to 750 ft. long. Infiltration under their flat stapled flanges is slight. The scientific construction of multiple layers of aluminum, fiber, and air spaces minimizes condensation formation on or within this type of insulation. Its slight mass is capable of little heat storage.

The National Bureau of Standards Booklet BMS52, "Effect of Ceiling Insulation Upon Summer Comfort" lists on Page 10 the relative effectiveness of the insulations tested in protecting ceilings against summer heat. First in effectiveness was two layers of aluminum foil (both sides of each layer reflecting). Second was full thick (3¾-inch) ordinary insulation. (Use coupon to get the booklet FREE!)

Try this test: Tack or scotch-tape 3 sq. ft. of multiple accordion aluminum (we will send it free on request) to the underside of a hot roof or ceiling, whether uninsulated, or insulated with ordinary material. Step in and out of the protected area beneath. The difference will be so marked you will need no thermometer.

To obtain MAXIMUM uniform depth protection against heat loss and condensation formation, it is necessary to use the new edge-to-edge multiple aluminum*, each sheet of which stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet. ***Patent applied for.**

COST OF EDGE-TO-EDGE INFRA
Multiple Aluminum Insulation
installed in new construction between wood joists, material with labor

Type 6-S under 9½¢ sq. ft.

Type 4-S under 7½¢ sq. ft.

A National Bureau of Standards brochure: "Moisture Condensation in Building Walls," interestingly discusses Vapor Flow, and causes and control of Condensation. Use the coupon for free copy.

INFRA INSULATION INC.
525 Broadway, N.Y.C., Dept. V-9

Please send FREE:

- ☐ Bureau of Standards Booklet, BMS 52, "Effect of Ceiling Insulation upon Summer Comfort."
- ☐ 3 Ft. Square of Multiple Accordion Aluminum for Test

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controversial sections of the new Code. The Commissioner has requested that taxpayers refrain from asking for rulings on specific problems. Instead, he urges taxpayers to consult the Code itself, copies of which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Copies may also be examined at district offices of the Internal Revenue Service.

One requirement that needs no further clarification is the following: filing date for individual tax returns will be extended a month, to April 15, starting next year, both income tax and estimated tax returns. If a final return is filed instead of the final amended declaration of tax, the deadline will be January 31 instead of January 15, as under the old law.

Rental Housing Threatened?

Some housing experts are having misgivings regarding the future of rental housing under the new housing bill. They consider it an "unhappy coincidence" in timing to have the recent windfall hearings on Capitol Hill just at the time the Housing Act of 1954 was making its way through Congress.

Senator Capehart predicts that the new Housing Act will boost sales homebuilding 10 to 20% because of the liberalized down payments and a bigger leeway on the amount for which the government will now guarantee mortgages. The new law, however, scales down the FHA mortgage guarantees on multi-rental mortgages from 90 to 80%. It stipulates that the project must be reappraised when completed, and the allowable mortgage brought back into line should costs prove lower than anticipated.

Even prior to the 90% mortgage incentives, private builders were somewhat wary of rental housing. Some of them now see a danger of over-restriction in the new loan program. They predict that potential builders of rental apartments will be shunted back into building sales houses exclusively. They point out that much rental apartment housing is still needed, particularly in such urban neighborhoods as New York, where anything other than an apartment to rent becomes prohibitely expensive.

About Defense

One thing can be said for Washington planners as they wrestle with the ever-changing problem of defense. The planners keep on trying, although the march of science has upset their calculations at every turn.

At one time it seemed that the "new look" idea of defense would suffice. Under that plan a streamlined military and industry team was decided upon. Air power and atomic weapons would be the front line, with ground forces held to a minimum. Along with this was coupled "massive retaliation", a threat of hitting back so hard that no potential enemy would dare start anything.

Then came the destruction of an entire atoll by an H-bomb, and an unexpected fall-out of irradiated debris which damaged ships and injured men scores of miles distant. All previous conceptions as to the lethal power of an H-bomb had to be revised, and all calculations as to a safety area for industry or populations had to be discarded.

Similarly, the plans which Washington has been perfecting to gear industry to a war or major emergency, are proving somewhat less than adequate. The Defense Materials System, for example, has been developed to channel production of military requirements. Only prime contractors and their immediate subcontractors would be responsible for an accounting of controlled materials. The program does not provide for an overall control of the economy in the event of an all-out attack on industry.

Similarly, a new "B" products order, which is about ready for preliminary study by affected industry groups, follows an almost identical pattern. The order does not anticipate a full-scale control of scarce materials. Instead, provision would be made for a percentage use of controlled materials for each product code. Within the permitted percentage range, manufacturers could operate without filing applications for controlled materials, and without accounting for their use. Percentage levels would change to reflect the supply picture and the military take.

In addition to control of materials for the benefit of the military, units of the Office of Defense Mobilization are working on related economic stabilization problems—wages, prices, rents, manpower. Again, the planners seek to key the degree of economic control to the demonstrated military need. This concept varies considerably from previous ideas that an emergency, regardless of its extent or duration, required all-out controls. Instead, today's planners hope to be able to apply just enough pressure in the form of material and economic controls to keep the economy in balance.

Unfortunately, the unexpected power of the H-bomb makes the best laid plans both inadequate and probably ineffective. In the H-bomb, the world seems indeed to have grasped a tiger's tail. As previously suggested in this column, perhaps the time has come to substitute peace plans for defense plans. After all, perhaps a potential enemy is also respectful of tigers. All plans to combat the H-bomb seem foredoomed to failure. From such a premise, outlawing of thermonuclear warfare might be argued to a successful conclusion.

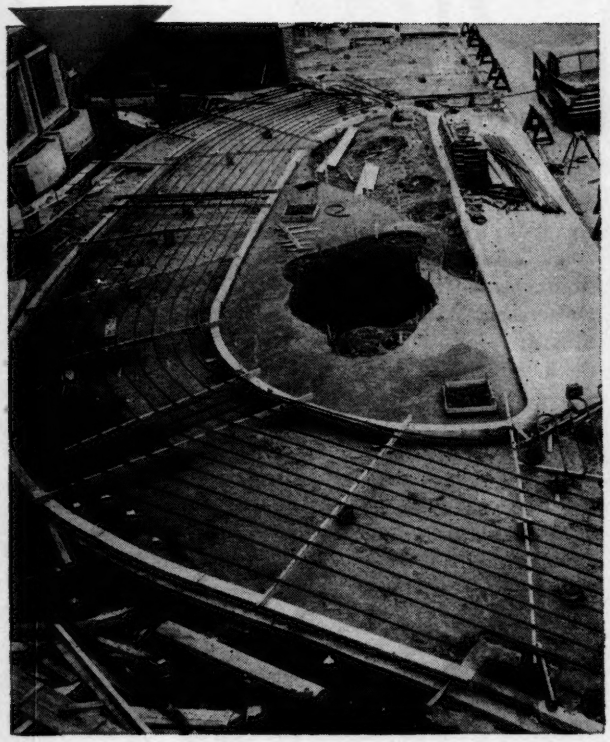
Washington Miscellany

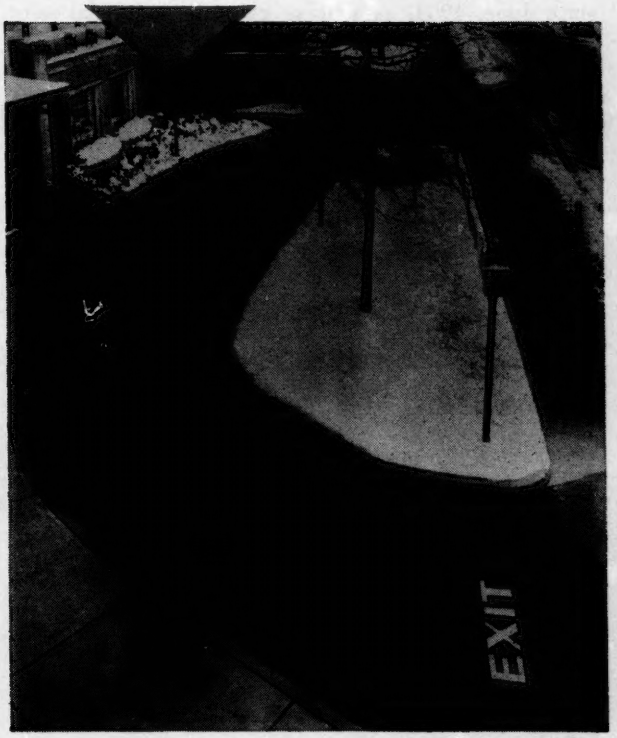
Advisory Panel Chartered. A charter making the Army Scientific Advisory Panel a permanent board in the Army organization, has been granted. The function of the panel will be to advise the Secretary of the Army, the Chief of Staff, and the Chief of Research and Development, on all scientific and related matters of interest. The entire panel will meet twice a year at a minimum, and can be convened more often by the chairman, Dr. James R. Killian, Jr., president of M.I.T.

Foreign Trade Booklet Ready. Channels For Trading Abroad, a 24-page booklet designed as an introduction for exporting and importing techniques, has been issued by the Bureau of Foreign and Domestic Commerce. Copies of the booklet are offered at 25 cents each by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Tanker Fleet Bill Signed. Two bills intended to stimulate private tanker construction and to increase the U. S. tanker fleet have been signed by the President. S-3458 permits U. S. negotiation with private operators for charter of fast tankers to be privately owned and constructed. S-2408 authorizes tanker owners to trade in World War II tankers to the government as part payment on newer and faster vessels.

The advantages of WROUGHT IRON PIPE for snow melting systems start with installation and continue in service





It isn't unusual at all for designers to divide the advantages of wrought iron pipe for snow melting into *installation* advantages and *service* advantages. We call them the "before-and-after" advantages of wrought iron, but regardless of title, they are mighty essential to that all-important goal—ECONOMY.

Let's take a look at what wrought iron pipe means to economy during installation. It's easily formed and welded, on the job, with standard equipment. No special techniques, no extra tools are needed for a fast, dependable job. Wrought iron pipe bends true, and is free from annoying "spring-back." This feature eliminates strain on connected equipment and speeds work. In welding or threading operations, wrought iron's uniform structure pays off in sound welds; sharp, full-depth threads, all accomplished in minimum time. Essential, too, is wrought iron pipe's strength. Users report that it has what it takes to withstand mechanical damage and doesn't require the "kid-glove" treatment.

Wrought iron pipe's superior "in service" reputation is built around three big points. First, its ability to resist corrosion, serve longer at lower cost per year, is providing satisfactory, economical operation in hundreds of snow melting installations. Second, wrought iron pipe's high rate of heat emission means maximum snow melting efficiency. Third, wrought iron pipe's coefficient of expansion, virtually identical to concrete over wide temperature ranges, bans the danger of thermal cracks, and loss of bond.

There is, of course, more to the wrought iron pipe snow melting story. Our bulletin, *Wrought Iron Pipe for Snow Melting Systems,* gives complete details. Write for your copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Dept.: New York, N.Y.

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CORROSION COSTS YOU MORE THAN WROUGHT IRON

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TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY STEEL PRODUCTS

BRIEFLY STATED

• Total utility and pipeline gas sales to ultimate consumers in June, 1954, were 4,180 million therms, the American Gas Association reports. Sales for the month were 4% higher than the 4,021 million therms sold in June, 1953, and represent an all-time high for June. The addition of approximately 800,000 new gas customers since June, 1953, as well as gains in industrial sales, account for the increase in gas sales. The Association's June index of total gas utility sales is 180.2% of the 1947-1949 average.

• A course dealing with plumbing and piping layouts and design will be offered with two hours credit in engineering at Wayne University, Detroit. The course was made possible by the combined efforts of Professor Dudley Newton of Wayne University and Lester Spitzley, chairman of the Education Committee, Michigan Chapter A.S.S.E. Lester Spitzley further announces that the Michigan Chapter is taking steps to establish one or more scholarships in this field.

• Early in the morning of June 15, a $500,000 fire swept through two production plants used by York-Shipley, Inc. and wiped out all facilities, including the machine shop, welding departments and assembly lines for domestic boilers and furnaces and industrial oil burners. Within one month from that day, new production facilities had been set up and complete line production of oil and gas heating equipment had been re-established in the company's York plant.

• Industry shipments of gas-fired central heating equipment (furnaces, boilers and conversion burners) are estimated at 346,500 units during the first half of 1954, an increase of 5.6% over the same period of last year. In June, gas-fired furnace shipments were 3.0% greater than in June of last year; gas-fired boiler shipments decreased 1.6% and conversion burner shipments were 29.0% below June of 1953. Oil-fired burner installations totaled 57,223 for the month of June, 1954, and 274,520 during the first half of current year.

• Four new vice presidents have been elected by the board of directors of the Bell & Gossett Company, Morton Grove. Those named were W. A. Boone, H. A. Lockhart, R. A. Marquardt, and C. R. Smith.

• The election of John Lawrence as executive vice president, is announced by Joy Manufacturing Co. Mr. Lawrence, in addition to assuming the responsibilities normally associated with his new post, will give special attention to efforts toward further diversification of the company's product lines. Mr. Lawrence joined the company in July 1951 as vice president of manufacturing and in April 1953 was named vice president of manufacturing and engineering. His prior experience includes seven years with SKF Industries Inc., where he served as vice president, and 10 years with Jones and Lamson Machine Co., where he was factory manager.

• Establishment of a commercial standard for warm air furnaces equipped with pressure atomizing or Rotary type oil burners has been announced by the Commodity Standards Division of the U. S. Department of Commerce. It is a voluntary standard of the industry and is identified as CS195-54. It provides a guide for the oil burning furnace industry, and a basis for certification of the quality and performance of warm air furnaces equipped with pressure atomizing or rotary type oil burners.

• A contract exceeding $5 million covering the installation of the heating, ventilating, and air-conditioning system in Manhattan's block-square, 42-story Socony-Vacuum Building, now under construction, has been let to Kerby Saunders, Inc., New York industrial and mechanical contractor by Turner Construction Co., builders of the structure. The Socony-Vacuum Building, with its 1,300,000 square feet of rentable space, will be the world's largest single commercial office building with 100% air-conditioning as an integral component of the structure itself. Owners of the building are Galbreath Corp., the architects are Harrison & Abramovitz-John B. Peterkin, and the firm of Jaros, Baum & Bolles are consulting engineers. A conduit Weathermaster system manufactured by the Carrier Corp. with a total refrigerating capacity of 4,000 tons will be installed.

• Those who attend the Middle Eastern District Meeting of the AIEE at the Abraham Lincoln Hotel, Reading, Pa., October 5-7, will inspect one of the nation's largest heat pumps in operation at the new headquarters of the Metropolitan Edison Company.

• A conference on silicosis and occupational chest diseases jointly sponsored by the McIntyre Research Foundation of Toronto, Canada, and the Saranac Laboratory of Saranac Lake, New York, has been arranged for February 7, 8, and 9, 1955, in the Town Hall at Saranac Lake. Anthony J. Lanza, M.D., formerly director of the Institute of Industrial Medicine and now emeritus professor of Industrial Medicine at New York University-Bellevue Medical Center, has been named chairman of the conference.

• During May, $7,737,750 worth of basic industrial equipment designed to meet anti-smog requirements was approved by the Los Angeles Air Pollution Control Department for the Los Angeles area. Besides indicating industry's compliance with smog rules, the figure reflected the continuing growth of industry. In connection with the factory and plant equipment, 365 operating permits were issued for smog control devices which cost $615,000. May was the sixth straight month in which applications for such permits exceeded 300. During the month, the district filed 26 misdemeanor cases against alleged smog law violators, heard 55 more in office hearings, and sent 310 written warnings to firms with installations which might cause smog.

• William R. Murdock has been appointed commercial sales manager of Trion, Inc., McKees Rocks, Pa. Mr. Murdock has been transferred from Chicago where he was regional sales manager. He will be in charge of all Trion Commercial Sales offices throughout the country.

design LEADERSHIP

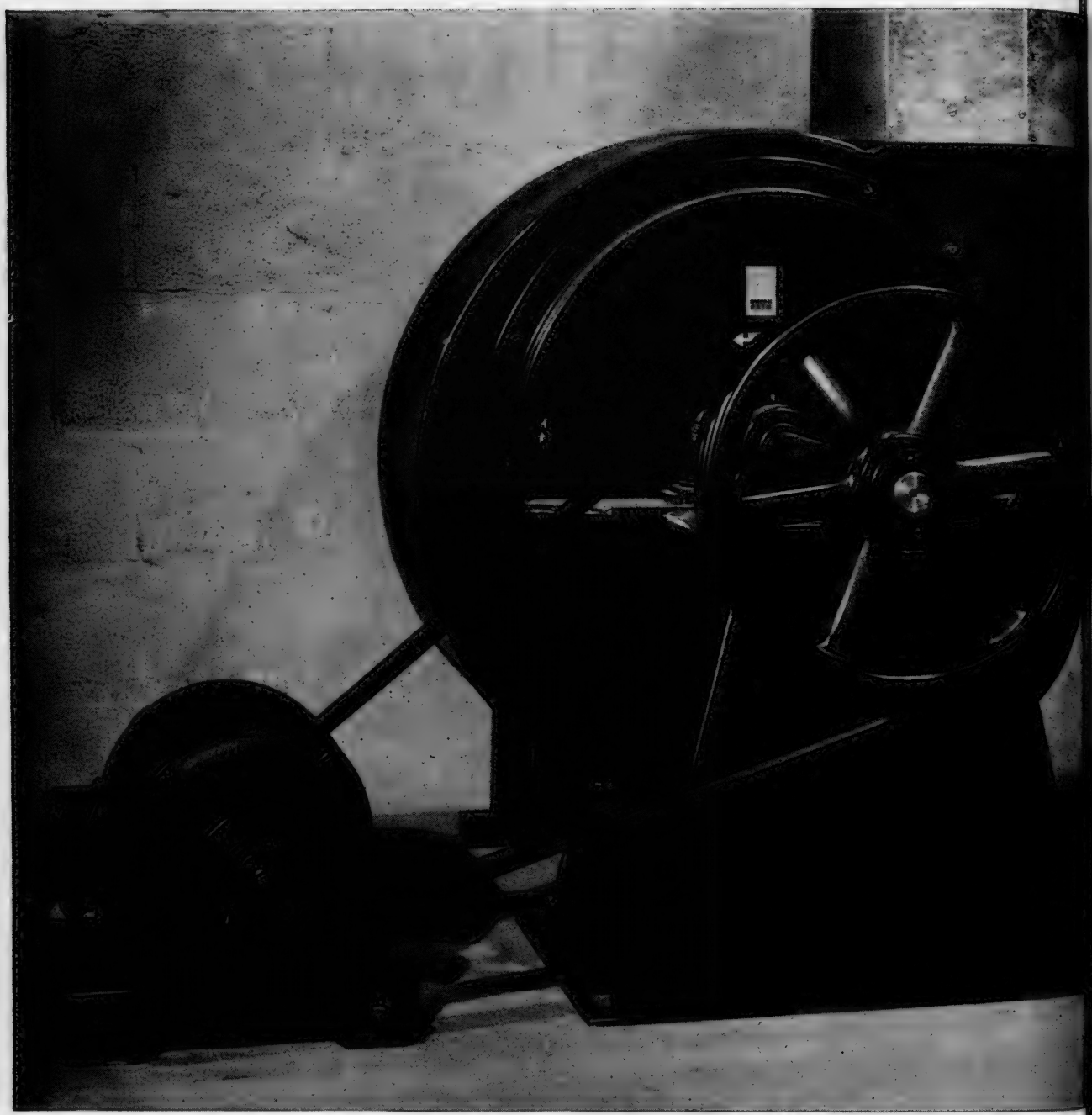
Revolutionary, exclusive, progressive—each is a suitable term in describing the Rubberflex sealed handle unit, now standard equipment on all COYNE & DELANY FLUSH VALVES. Shown in exploded view above, this patented unit marks a singular advance in flush valve design. Springless and packingless, the Rubberflex provides a diaphragm seal to increase the leak free life of the handle many times over. Being springless, is is impossible for the Rubberflex handle to stick in the open position. Consistent with the DELANY theme of simplicity of design, the Rubberflex handle is constructed of only four parts—as opposed to the standard eight part spring loaded handle still in universal use. For more detailed flush valve and vacuum breaker data contained in Handbook and Catalog 53, write Engineering Department.

COYNE & DELANY CO., 834 KENT AVE., BROOKLYN 5, N. Y.

DELANY-*the fastest growing name in flush valves!*

Complete

With 3 Extra



ALLIS-

Service

Allis-Chalmers Benefits

Put the Allis-Chalmers control-motor-drive combination on your air conditioning job and you'll benefit three ways:

Engineering Help

1 The local Allis-Chalmers district representative or distributor will engineer the complete control-motor-drive for you . . . you'll save *hours* and *dollars* of engineering time!

Coordinated Equipment

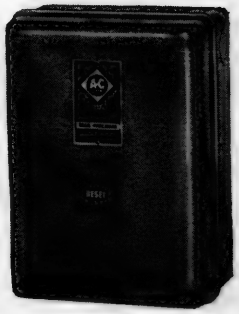
2 You don't have the problem of coordinating three sources of supply . . . A-C components are designed and built to work together smoothly and efficiently!

Guaranteed Performance

3 You get the benefit of one responsibility for equipment service and performance. The complete Allis-Chalmers control-motor-drive combination is *guaranteed* to perform as a unit. Nation-wide service is readily available.

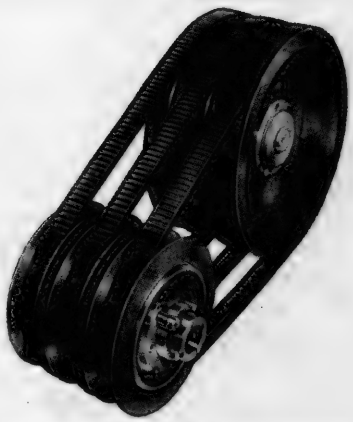
Get Allis-Chalmers control-motor-drive combination on your next job . . . get these three benefits for a smoother, money-saving installation.

A-4208



CONTROL

MOTOR



Texrope DRIVE

Ample

NATION-WIDE STOCKS

A wide selection of control-motor-drive equipment used in the air conditioning industry is maintained by Allis-Chalmers district offices and authorized distributors. In addition, an efficient warehouse inventory system locates seldom-called-for items within hours after you call. For immediate action specify Allis-Chalmers equipment.

Nation-Wide

CERTIFIED SERVICE

With A-C equipment, there's always service near. Allis-Chalmers Certified Service Shops are independently owned...meet the high A-C standards for modern equipment, efficient methods, and business integrity. These shops assure your customers factory approved parts, equipment, and fast efficient service.

Send for FREE Engineering Literature

Allis-Chalmers, Milwaukee 1, Wisconsin

MOTORS

- ☐ Handy Guide to Motor Selection — 51B6052
- ☐ Squirrel-Cage Motors — 51B6210

CONTROL

- ☐ Handy Guide to Starters — 14B7733
- ☐ Reduced Voltage Starters — 14B7215

***TEXROPE* DRIVES**

- ☐ Handy Guide to *Texrope* Drives — 20B6051
- ☐ *Vari-Pitch* Drive Engineering Data — 20B7499

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

CHALMERS

A-C ALLIS-CHALMERS

How Honeywell Customized

Temperature Control helps provide

The kind of "Indoor Weather" your clients need

Customized Temperature Control installation at Corning Glass Center is a good example.

AT THE Corning Glass Center in Corning, New York, you'll find a museum, offices, shops—and production areas where Steuben glassware is made.

Such a variety of functions under one roof calls for scientific temperature control—if the "indoor weather" is to be comfortable throughout the building.

Today the best way to provide proper "indoor weather"—whether a building houses one function or many—is through the use of *Honeywell Customized Temperature Control.*

The key word here is "customized". It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants is your answer.* This applies not only to heating and cooling, ventilating and humidity control—but to industrial control as well.

Only Honeywell can provide true "customized" control. Because only Honeywell manufacturers all three types of controls—pneumatic, electric and electronic.

The story, in brief form, of the Honeywell Customized Temperature Control installation in the Corning Glass Center is told by the floor plan and picture captions you see here.

They tell how specific occupancy, use and exposure problems were met.

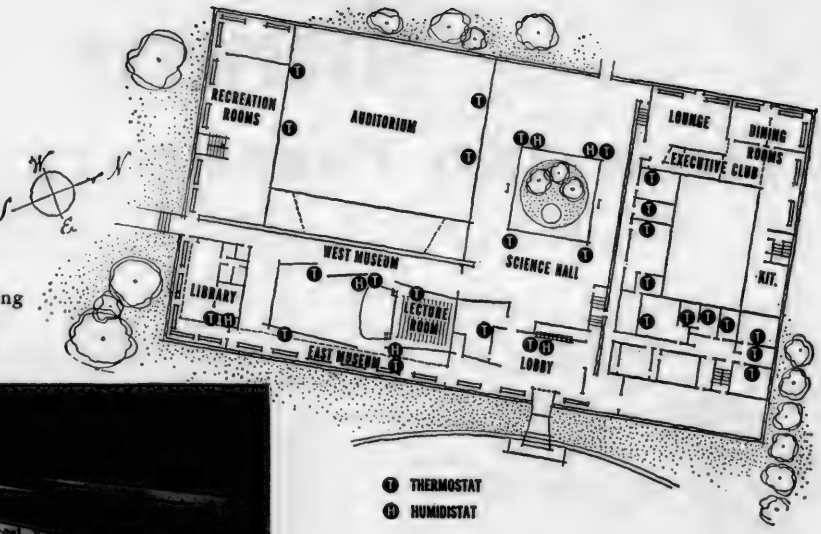
The *techniques* used, applied to your particular problems, can help you give your clients the "indoor weather" they've always wanted.

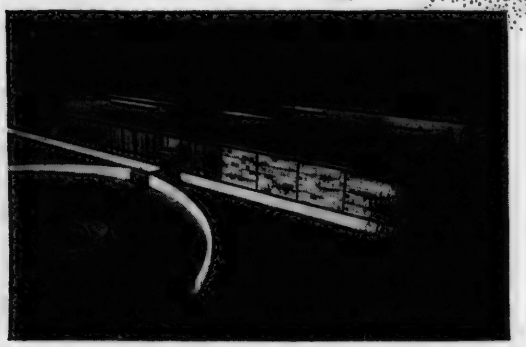
Interior garden of Corning Glass Center

Architects: Harrison, Abramovitz and Abbe, New York, N. Y.

Mechanical and Electrical Consulting Engineers: Jaros, Baum and Bolles, New York, N. Y.

Air Conditioning Consulting Engineers: Henry Peck Associates, Fairport, N. Y.





This panorama of the Corning Glass Center shows the temperature control problems involved. Huge glass window areas face four directions. Whether it is sunny or cloudy makes a big difference to the heating and cooling system. But Honeywell Customized Temperature Control, using electronic and pneumatic thermostat and humidistats, keeps the building comfortable all the time.

Interior heating and cooling factors are important, too. Take the auditorium above, for instance. With a large crowd you have one heating problem. With a small group, quite another. But the four Honeywell thermostats located here handle either situation easily.

The internal heating problem in the display room above is somewhat similar to that of the auditorium. But when it is crowded (requiring little heat) the auditorium might need considerable heat. Yet with enough thermostats, strategically placed, both areas are comfortable.

For comfortable, even temperature in new or existing buildings—of any size—specify Honeywell Customized Temperature Control

Whether it's a factory, motel, hospital—or any building of any size—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems. You can give your clients more comfort and efficiency. And they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office Or mail the coupon today.

James M. Brown, III, director of the Corning Glass Center, says:

"Today our Glass Center is one of the most comfortable buildings in the country. Important in helping make possible this comfort is our Honeywell Customized Temperature Control installation."

MINNEAPOLIS
Honeywell

First in Controls

112 OFFICES ACROSS THE NATION

Minneapolis-Honeywell Regulator Co.
Dept. HV-9-60, Minneapolis 8, Minnesota

Gentlemen:

I'm interested in learning more about Honeywell Customized Temperature Control.

Name.....

Firm Name.....

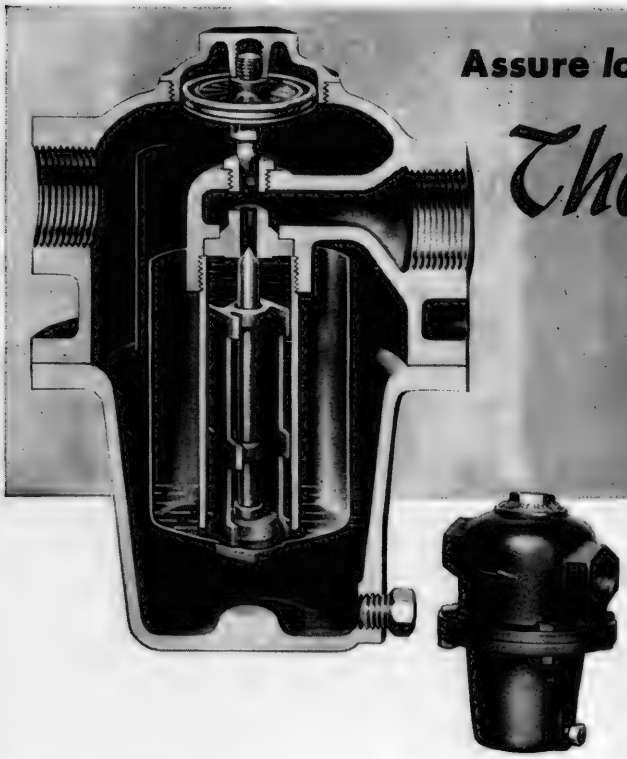
Address.....

City..... *Zone*..... *State*.....

illinois

FLOAT AND THERMOSTATIC TRAPS

SERIES G • FOR LOW PRESSURE STEAM SERVICE



Assure lower return line temperatures

They're different!

–in construction

–in performance

Recommended Applications . . .

Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Process Heaters, Hot Water Generators, Drips of Mains and Risers.

Illinois Float and Thermostatic traps operate under vacuum with the same high efficiency as under pressure. No more water-logging in mains...no more air pockets...put an end to "morning overload" troubles. The condensate control valve provides complete and instantaneous drainage of condensate while a separate thermostatically controlled valve in cover vents air in large volume, yet prevents loss of valuable steam.

The condensate valve is actuated by impact when the float drops—a snap action that is independent of the rate of flow of the condensate. Valve is not directly attached to the float and is either tightly closed or wide open. This instantaneous operation makes wire drawing impossible.

Illinois traps, because of their unique valve action, function perfectly at all load conditions, with lower return line temperatures than ordinary type traps. Lower return line temperatures assure higher vacuum pump efficiency. Straight through connections save head room, fittings, labor. Trap is easily opened for inspection. It is not damaged by freezing. Sizes from ¾ inch to 2 inches.

Write for Bulletin

ILLINOIS ENGINEERING COMPANY

illinois ENGINEERING

2045 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

Sh-h-h

GET YOUR AIR NOISE LEVEL DOWN WITH "HUSH-A-BYE" QUIET "BUFFALO" TYPE "BL" FANS

One way to reduce your noise level is to select quiet fans.
And now, as never before, you can enjoy almost unbelievable quiet with the new "Buffalo" Type "BL" Fan.
Streamlined air movement through "Buffalo's" fixed inlet vanes and new backward curved blade wheel results in high efficiency, superb smoothness and quietness.
It's another example of the "Q" Factor* which has long made "Buffalo" your best fan buy.
Why not investigate this superbly performing fan today?
Write for Bulletin F-100.

**The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

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480 BROADWAY BUFFALO, N. Y.

Publishers of "Fan Engineering" Handbook

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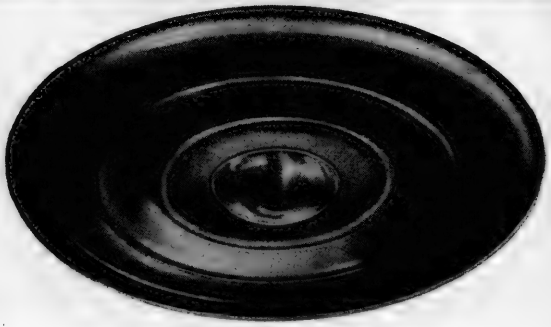
NTILATING PRESSURE BLOWING AIR CLEANING COOLING AIR TEMPERING HEATING INDUCED DRAFT FORCED DRAFT EXHAUSTING

Aerofuse

In appearance, Aerofuse Diffusers are styled to harmonize with contemporary architectural concepts . . . in performance, the flexibility of the line permits engineers to select a type and size that will operate with top efficiency . . . simplicity of design and rugged construction result in simplified installation. Good reasons why Aerofuse Diffusers have nation-wide acceptance by architects, engineers, contractors and owners, and are installed in the most modern multi-story office buildings and department stores, in commercial and recreational buildings, institutions and industrial plants . . . wherever people work or relax in air conditioned comfort.

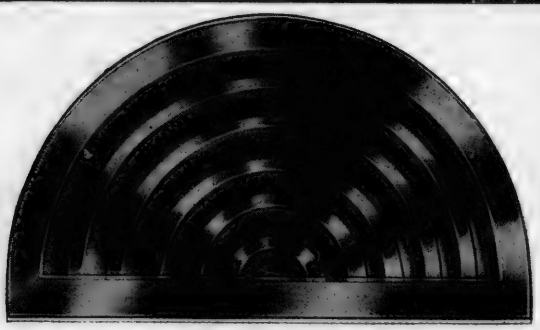
TYPE PA
Adjustable pattern diffuser

TYPE PR
Flush type, fixed pattern supply and return diffuser



TYPE PLF
Flush type, fixed pattern diffuser combined with light fixture

TYPE S
Flush type, fixed pattern diffuser

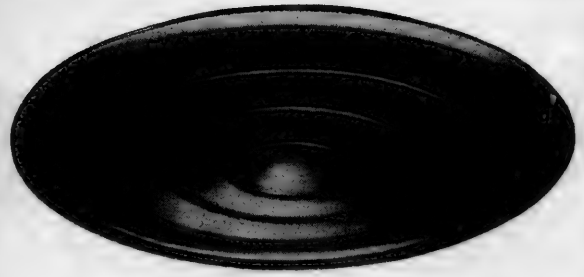


TYPE H
Flush type, fixed pattern half-round diffuser

Accessory Equipment

To meet specific air delivery requirements, volume control dampers, distributing grids, blanking baffles, and other accessory equipment is available for all Aerofuse Diffusers.

A wide selection of diffuser types and sizes, styled and engineered to meet the most rigid requirements of appearance and performance at the point of air delivery



TYPE PS
Stepped-down type, fixed pattern diffuser

TYPE PF
Flush type, fixed pattern diffuser

TYPE PH
Flush type, fixed pattern, half round diffuser

TYPE D
Flush type, fixed pattern square diffuser

TYPE ES
Stepped-down type, fixed pattern diffuser

TUTTLE & BAILEY inc

T & B

NEW BRITAIN, CONNECTICUT

NEW . . . Aerofuse Catalog No. 108.

Complete information on the Aerofuse line of ceiling diffusers and accessory equipment, engineering data, size selection charts and directions for installation. Send for your copy today.

Illinois Institute of Technology, Chicago, uses

Illinois Tech Buildings Received 1953 Award from A.I.A., Chicago Chapter, "for their simplicity of design and compatability of design to function."

Architect: MIES VAN DER ROHE
Associate Architects:
FRIEDMAN, ALSCHULER & SINCERE
HOLABIRD & ROOT & BURGEE
PACE ASSOCIATES
Mechanical Engineers: ROBERT E. HATTIS
SAMUEL R. LEWIS & ASSOCIATES
Contractors: ECONOMY PLBG. & HEATING CO.
WILLIAM A. POPE CO.

Left: Chemistry Building • Below: Metallurgical and Chemical Engineering Building

POWERS CONTROL

Since 1891

Below: Carman Hall.
One of three similar apartment buildings. They provide modern living quarters for students and staff. Each apartment has a POWERS Thermostat controlling hot water radiant heating. Ventilation is also POWERS controlled.

POWERS

pneumatic systems of temperature control

to regulate heating systems in these prominent buildings:

Armour Research Laboratory • Chemistry Building
Metallurgical and Chemical Engineering
Institute of Gas Technology
Association of American Railroads Building
Alumni Memorial Hall
Network Calculator Laboratory
Sound Laboratory • Machinery Hall
Carman Hall and two other Apartment Buildings
New Commons Building

"Illinois Institute of Technology is growing to be the best architectural expression of a technical college in the world . . . and perhaps the only really consistent one." — *From Architectural Forum, Nov. 1952.*

In modern buildings of many famous colleges from coast to coast, such as Massachusetts Institute of Technology, Harvard University, Carnegie Tech, U.C.L.A., and California Institute of Technology, you'll find POWERS pneumatic systems of temperature control. Since 1891 they've been outstanding for their many years of dependable service with a minimum of maintenance.

When you have problems of control for heating and air conditioning systems or industrial processes, call in a POWERS engineer. Experience we have gained in all types of prominent installations should be helpful to you.

THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS
Offices in 60 cities in the U. S. A., Canada and Mexico

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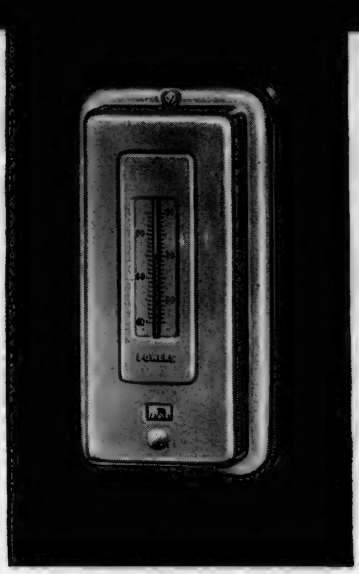
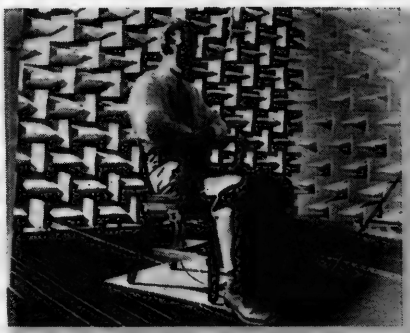
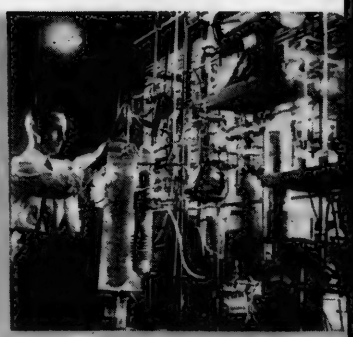


Powers Room Type Thermostat pneumatically regulates heating and air conditioning systems. Users often report over 30 years of accurate dependable service.

Many other types of Powers Control are used at Illinois Tech: Recording Controllers for Wet and Dry Bulb; Master-Submaster Controls; ACCRITEM Regulators; LIMITEM Thermostats; Powers FLOWRITE diaphragm Valves and Packless Valves for Convectors, Radiant Panel Control, etc.; Powers POWERSTROKE Damper Operators, etc.



Acoustical Research Chamber



Vacuum Fusion Test Apparatus

AC Network Calculator

"Research Improves Everybody's Future. It accelerates industrial progress, buttresses national security, and advances technological frontiers. It is a means of harnessing science to serve man's economic ends." *H. A. Leedy, Director of Armour Research Foundation, Illinois Tech, Chicago.*

Students, Research Scientists and Engineers do their best work in the comfortable thermal environment provided by a Powers pneumatic system of Temperature Control.

Strength Testing Fluorescent Lighting Unit in Engineering Mechanics Lab.

Roll Test Model for Developing Airpla and Rocket Flight Control Devices

Over 60 years of Automatic Temperature Control

NOW!

A BRAND NEW ADDITION TO THE FAMOUS CARNES QUALITY LINE

POWER ROOF VENTILATOR

CARNES

NEW MODEL B

CENTRIFUGAL

- QUIET OPERATION
- PROTECTED MOTORS
- MAXIMUM CAPACITY

Here's the latest in famous Carnes Power Roof Ventilators . . . the new Model B with centrifugal fan wheel. Ruggedly constructed for years and years of trouble-free service, and with these outstanding features: Belt-driven for greater flexibility of fan speed; motors are mounted on vibration eliminators; low silhouette; aluminum housings are standard, also galvanized copper or stainless steel; hinged motor hood; large capacity, precision-built fan wheels balanced both statically and dynamically. Write today for literature, prices and complete information.

Sizes—15" through 60" wheel.
Capacities—2,000 to 50,000 C.F.M.

PLUS . . . THESE OUTSTANDING MODELS

MODEL CL

CENTRIFUGAL

A modernly designed centrifugal type ventilator that features all aluminum construction; quiet operation; low silhouette; heavy duty, ball-bearing, protected motors; maximum capacity; precision-balanced fan wheels.

Sizes—4" through 24"
Capacities 200 to 7500 C.F.M.

MODEL AX

AXIAL FLOW

Identical modern design as Model CL, but equipped with axial flow fan. Exceptionally quiet in operation, and with all the same quality construction features that are provided in the CL.

Sizes—10", 12" and 16"
Capacities—550 to 3500 C.F.M.

CARNES — The Most Talked About Name in Air Distribution

W. R. CARNES CO., VERONA, WISCONSIN

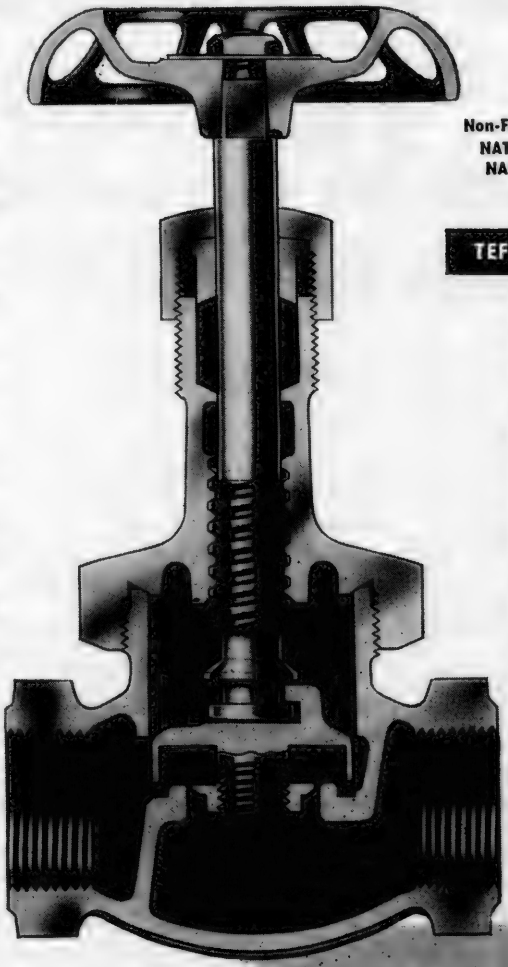
This "Hospital Valve" for **OXYGEN** now serves many industrial needs . . .

JENKINS Fig. 504 Bronze Globe with **TEFLON** disc and packing

Jenkins Fig. 504 was designed for the critical requirements of controlling oxygen, nitrous oxide, or any non-flammable gases in hospital services. Industry was quick to note its unique advantages, and it is now frequently specified for systems carrying gaseous fluids for heating, cooling, lighting, and processing, where pressure does not exceed 400 psi, or temperature a maximum of 150° F.

Fitted and tested to comply fully with all Association specifications for hospital services, Fig. 504 has the "extra value" construction throughout that is assured by Jenkins quality standards.

Get details — find out how Fig. 504 can improve efficiency and economy in your hookups for critical service. It's another example of the broad range of "valves for every service" in Jenkins' complete line.



Complies fully with "Standards for Non-Flammable Medical Gas Systems" of—
NATIONAL FIRE PROTECTION ASSOCIATION
NATIONAL BOARD OF FIRE UNDERWRITERS
AMERICAN HOSPITAL ASSOCIATION

TEFLON Disc and Packing

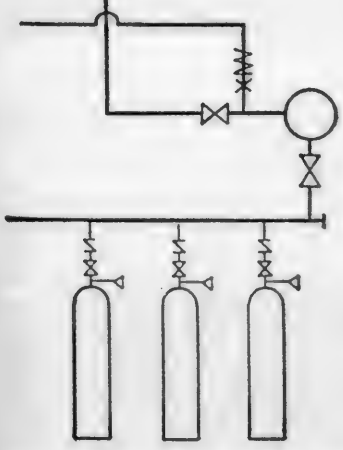
DuPont "Teflon" is a tough, "waxy" inert solid, gray-white in color, tasteless and odorless, non-adhesive and frictionless. Teflon's high resilience assures perfect contact of disc with lapped, crowned seat for gastight closure. Packing is one-piece ring of Teflon, provides dependable leak-proof seal with light compression.

Reinforced Body Casting
High strength bronze body is ribbed along bottom centerline providing extremely high factor of safety. Guards against distortion from vibration, shock, or pipe strains.

Degreased
All bronze parts are thoroughly degreased before assembly.

Polished Spindle
Alloy bronze spindle is polished to permit easy turning and assure leak-proof seal.

Sizes
— ¼" to 2" — 400 lb. O.W.G.



GET COMPLETE INFORMATION from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 116.

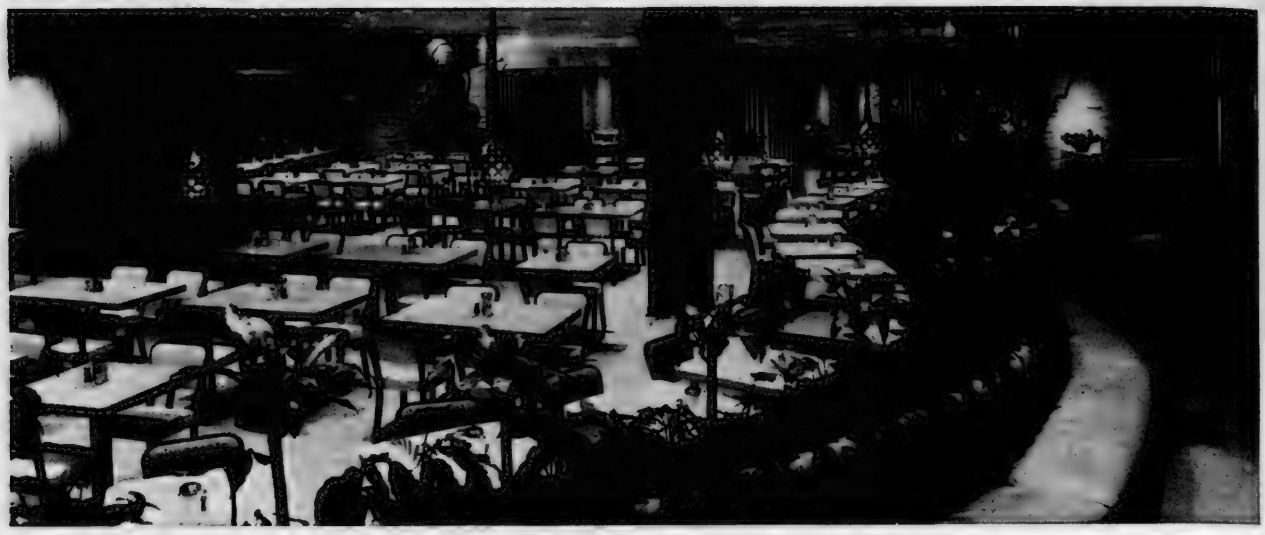
JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

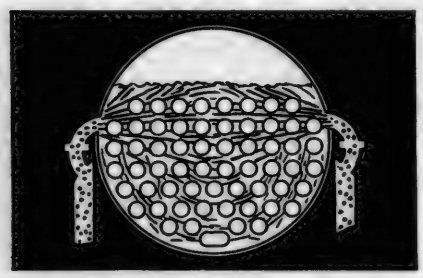


Located in the world-famous Country Club Plaza district of Kansas City, Putsch's Cafeteria has a reputation as one of the finest eating places in the United States. Architect—Edward W. Tanner & Associates; Builders—J. C. Nichols Company; Heating Contractor—Inter-State Heating & Plumbing Company; all of Kansas City, Mo.

Putsch's Cafeteria wins national award . . . uses Pacific Boiler with *Jet-action* Circulation!

FOR exceptional design and decor, and the highest standards of sanitation, food preparation and service—Putsch's Cafeteria, Kansas City, Mo., received First Award in Institutions Magazine's Annual Food Service Contest. Many consider Putsch's the finest cafeteria in the world!

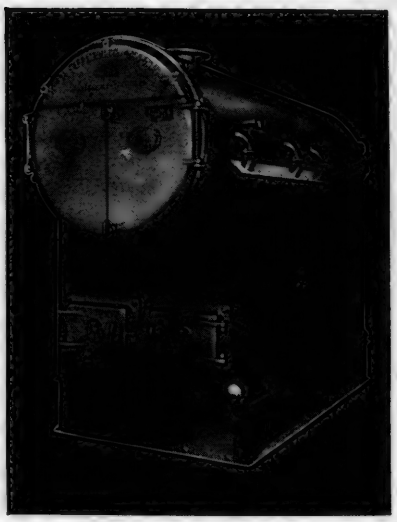
Diners can park above the cafeteria, walk down, and enjoy superb food at family prices . . . . in an atmosphere tempered by a Pacific Boiler with *Jet-action* Circulation.



Exclusive *Jet-action* Circulation

Increases heat transfer, saves fuel! Putsch's Pacific Boiler with *Jet-action* Circulation gives more heat for a given amount of fuel than any other boiler of the same capacity. Pacific's exclusive circulating connections project hot water and steam across the heating tubes at high speeds; heat-insulating bubbles are swept away—and kept away. Tubes transfer heat faster . . . fuel consumption is lowered . . . response is practically immediate when a change in temperature is desired.

Take a tip from the national award winner, Putsch's—the only cafeteria in the United States to receive such honor this year. Improve your installations and assure your customers greater satisfaction with Pacific Boilers. Available in all sizes, using all fuels, for any type building. For engineering data, catalogs or any other information, call your local Pacific representative.



A Pacific High Firebox Boiler heats Putsch's Cafeteria. When temperature change is desired, *Jet-action* Circulation makes response practically immediate.

Designed Constructed and Stamped in Accordance with ASME Code

UNITED STATES RADIATOR CORPORATION: Boilers, Radiators, Heating Accessories • Pacific Boilers • Cyclotherm Steam Generators • Metal Products • Drayer-Hanson Air Conditioning and Commercial Refrigeration

PACIFIC Pacific Steel Boiler

DIVISION • UNITED STATES RADIATOR CORPORATION

GENERAL OFFICES: DETROIT 31, MICHIGAN

DYCON

TYPE DY

ONE-INCH

CONTINENTAL

offers the NEWEST DEVELOPMENT in DRY AIR FILTERS

for air conditioners, warm air furnaces, and air-handling equipment

RINSE and REUSE

DYCON, an un-oiled media of selected synthetic fibers, removes and retains dust particles from the air stream by means of an accumulated static charge. Exceptional capacity means infrequent servicing. Rinse under open water faucet or nozzleless hose, shake out, and return. Rustproof aluminum frame.

Available in all standard sizes, one-inch thickness . . . in custom sizes at only slight added cost.

Write today for bulletin No. 550, DYCON Type DY.

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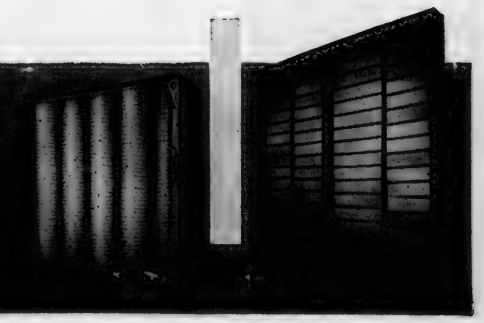
P. O. BOX 1647 LOUISVILLE 1, KY.

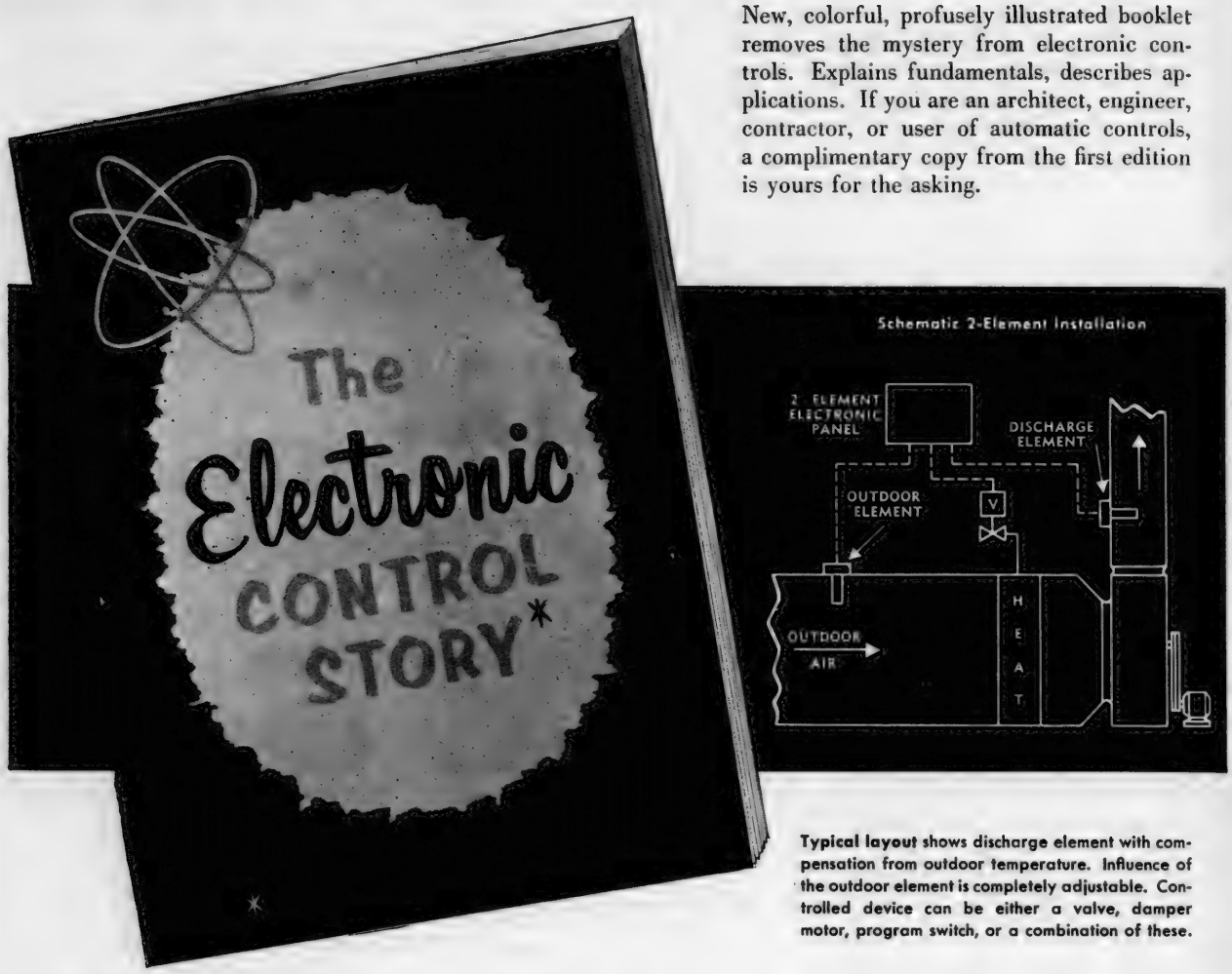
CONTINENTAL AIR FILTERS Inc.



BARBER COLMAN

New "primer" on electronic controls

New, colorful, profusely illustrated booklet removes the mystery from electronic controls. Explains fundamentals, describes applications. If you are an architect, engineer, contractor, or user of automatic controls, a complimentary copy from the first edition is yours for the asking.



Typical layout shows discharge element with compensation from outdoor temperature. Influence of the outdoor element is completely adjustable. Controlled device can be either a valve, damper motor, program switch, or a combination of these.

Now available from Barber-Colman for automatic control applications

	FOR
ELECTRONIC CONTROLS	TEMPERATURE CONTROL
OR	Single-Element
ELECTRIC CONTROLS	Averaging Control
OR	Reset Control
COMBINATION ELECTRONIC-ELECTRIC CONTROLS	Room Discharge Control with or without winter and summer compensation
	HUMIDITY CONTROL
	PROCESS CONTROL

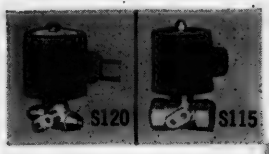
Early interest in electronics at Barber-Colman Company led to the invention of the radio-controlled garage door in 1926. Process controls for textile machinery followed. Then, during World War II, came electronic devices for aircraft. This extensive *electronic* background, coupled with multi-year experience with *electric* controls, has made possible important contributions to modern control systems for the heating, ventilating, and air conditioning industry.

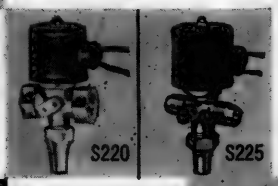
Today, you have available not only a complete range of reliable instruments for control of temperature, humidity, or industrial processes, but you can benefit from Barber-Colman's vast reservoir of application experience. Phone your nearby Field Office for latest information on electric, electronic, or combination electric-electronic systems.

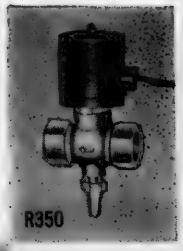
BARBER-COLMAN COMPANY

Dept. I, 1302 Rock St., ROCKFORD, ILL., U.S.A. Field offices in principal cities

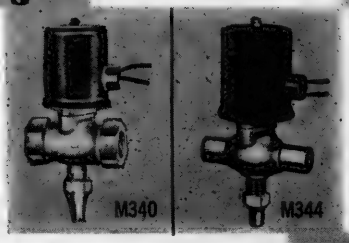
Automatic Controls • Air Distribution Products • Industrial Instruments
Aircraft Controls • Small Motors • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery







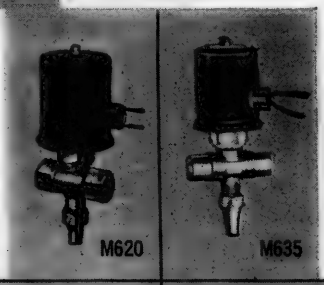
ALCO
SOLENOID VALVES

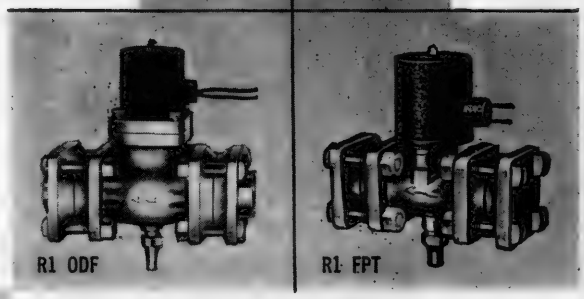


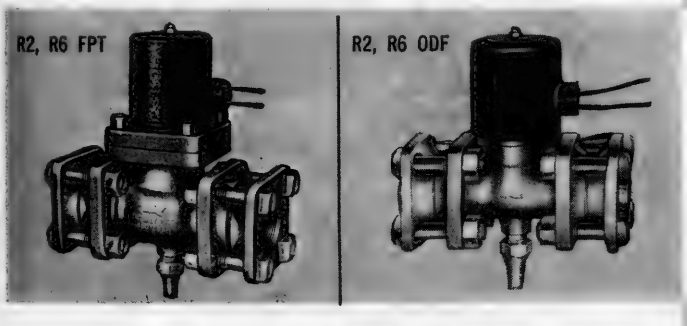
the complete line

- for Freon-12, Freon-22, Methyl Chloride and Ammonia
- for liquid line, suction line or hot gas discharge service
- for brine, water, steam, air, oil
- for all types of electric current
- for wide range of connections: ½" to 2⅝" solder, ⅜" to 2" pipe thread
- for use with thermostats, float switches, timers, and many other control devices

Special valves for special applications are available.







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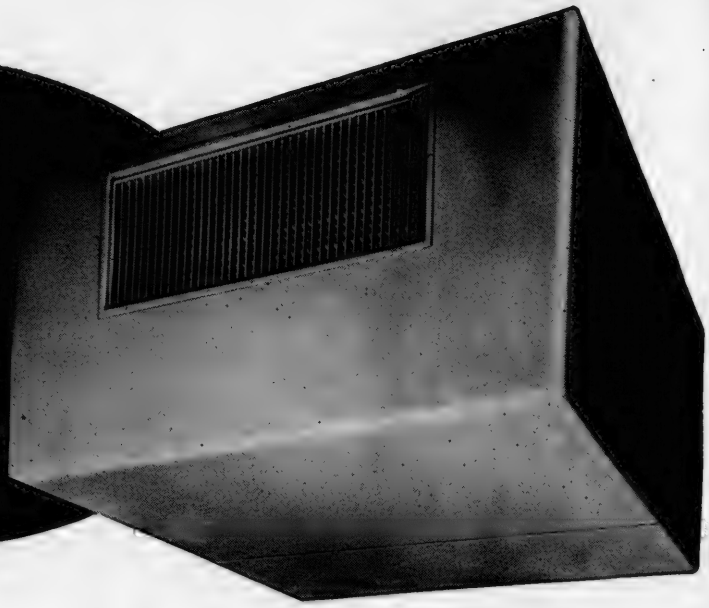
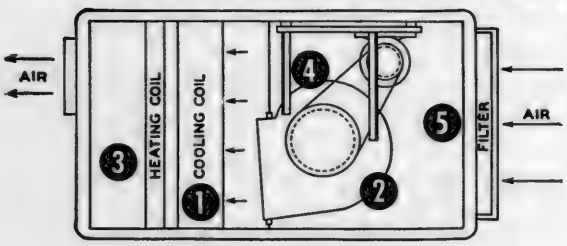
NEW FEATURES of PROVEN MERIT



KRAMER

AIR CONDITIONING UNITS



1 MUGGY-AIR-CONTROL

It "squeezes" extra moisture from the air on muggy days without reheating, dampers or excessive cooling. No short cycling and uncomfortable conditions.

2 BLOW-THROUGH DESIGN

Fan-motor assembly always exposed to normal room temperatures. A unique design with many advantages, resulting in —

No motor overload and no loss of bearing lubricant from hot air of the heating coils.

No corrosion of fan-scroll assembly from moisture carry-over of the cooling coils.

3 ANTI-SWEAT CONSTRUCTION

Only a small portion of the casing is exposed to cooled air; that section is heavily insulated.

Access doors and grille have scientific anti-sweat designs.

4 QUIET OPERATION

The fans and motor form an integrated assembly independently rubber-mounted to the casing. All moving parts are completely isolated by rubber.

5 FOR FINISHED INTERIORS

Graceful lines with no unsightly belts, motor and guards exposed to view. Finished in hammer gray enamel.

MANY OTHER OUTSTANDING FEATURES

WRITE FOR BULLETIN AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

it keeps the home fires burning!

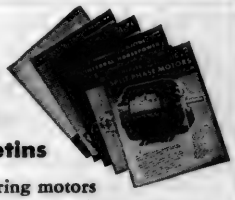
Oil heat — automatic, dependable, economical — is a symbol of comfortable living in homes everywhere.

Many of America's best known oil burner manufacturers depend upon Emerson-Electric motors to keep their units operating efficiently.

Emerson-Electric builds motors for specialized applications such as oil burners, and for all types of equipment where dependability and long life are of first importance. It has done so for 64 years, and offers standard motors in ratings from 1/20 to 5 h.p., and hermetic motors 1/8 to 20 h.p. Your inquiry is invited.

THE EMERSON ELECTRIC MFG. CO.
St. Louis 21, Mo.

Write for these Emerson-Electric Motor Data Bulletins



Manufacturers requiring motors 1/20 to 5 h.p. can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ M443-A Capacitor-Start
- ☐ M443-B Split-Phase
- ☐ M443-C Integral
- ☐ M443-D Fan-Duty
- ☐ M443-E Oil-Burner
- ☐ M443-F Jet Pump
- ☐ M443-G Blower

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

How to Select an Economical Temperature Regulator

First of all, what does *economy* mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it ean be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you could expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T 500 containing further details? SE 130

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

UNARCO DOWN BLOW UNIT HEATER

Drop-out motor for easy service. Full venturi for quiet operation. Full range of capacities in standard CFM and high CFM.

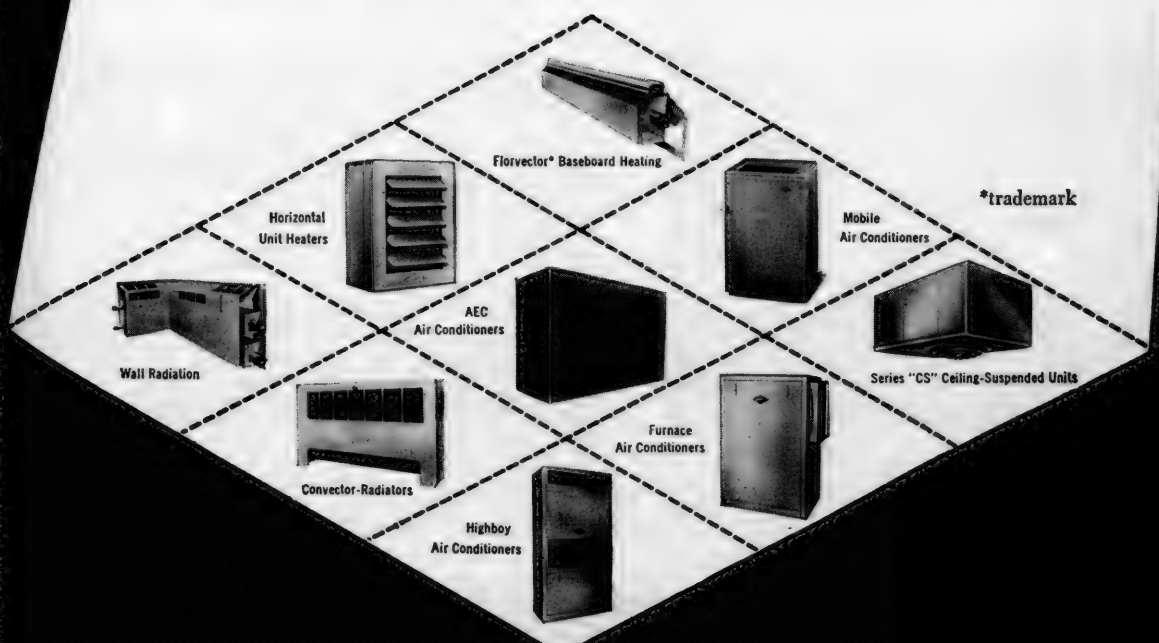
UNARCO®

year 'round weather conditioning*

Whether your needs are heating or air conditioning equipment, get the facts on the complete UNARCO line before you buy. UNARCO offers so much more in quality, economy and efficient performance.

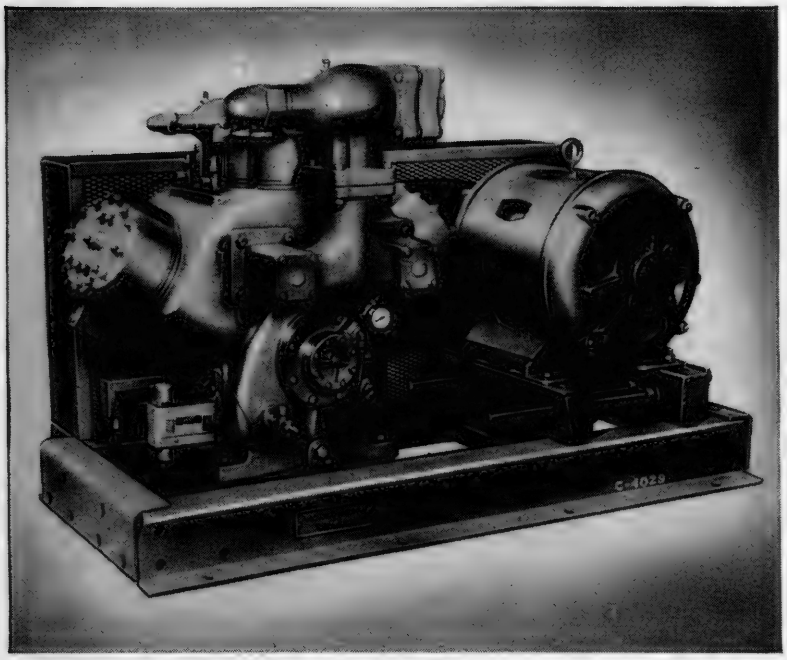
UNARCO heating and cooling products are priced to sell . . . available in a complete range of types and sizes.

55 sales offices from coast to coast and Canada to serve your needs.



*trademark

The whole industry's talking about Worthington's new Freon compressor



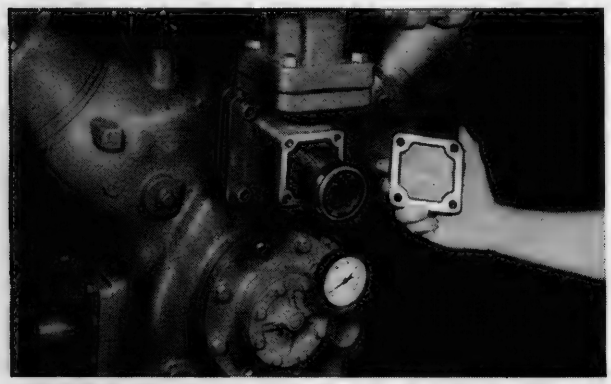
TRIM, STURDY CONSTRUCTION marks this 4JF6 compressor unit — 50-60 hp, six cylinder W-type compressor. The complete compact unit consists of fabricated steel base, compressor with valves, gauges and safety controls, drive and safety guard. Designed to operate in conjunction with Worthington evaporative condensers in localities where city water is scarce or high in cost. Also available with shell and tube condenser. Complete range from 3-150 hp.

"The high capacity unit we've been waiting for!"

"Greater operating efficiency!"

"There's nothing else like it!"

And every comment you hear is true! The refrigeration compressor is the most vital element of any air conditioning or refrigeration system. That's why Worthington spent years in developing the new "J" Freon compressor. That's why Worthington invested over a million dollars in compressor research. *And that's why you can't find its match in any other unit.* Only a few features of the new "J" Freon compressor are highlighted here — get the full story by contacting your nearest Worthington district office or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.4.33, Harrison, New Jersey.



EASY REMOVAL of suction gas strainer for cleaning is made possible by new suction manifold design. No pipes, valves or other parts need to be dismantled in order to get at the strainer. And Worthington's new electric unloaders automatically balance power consumption with load requirements.

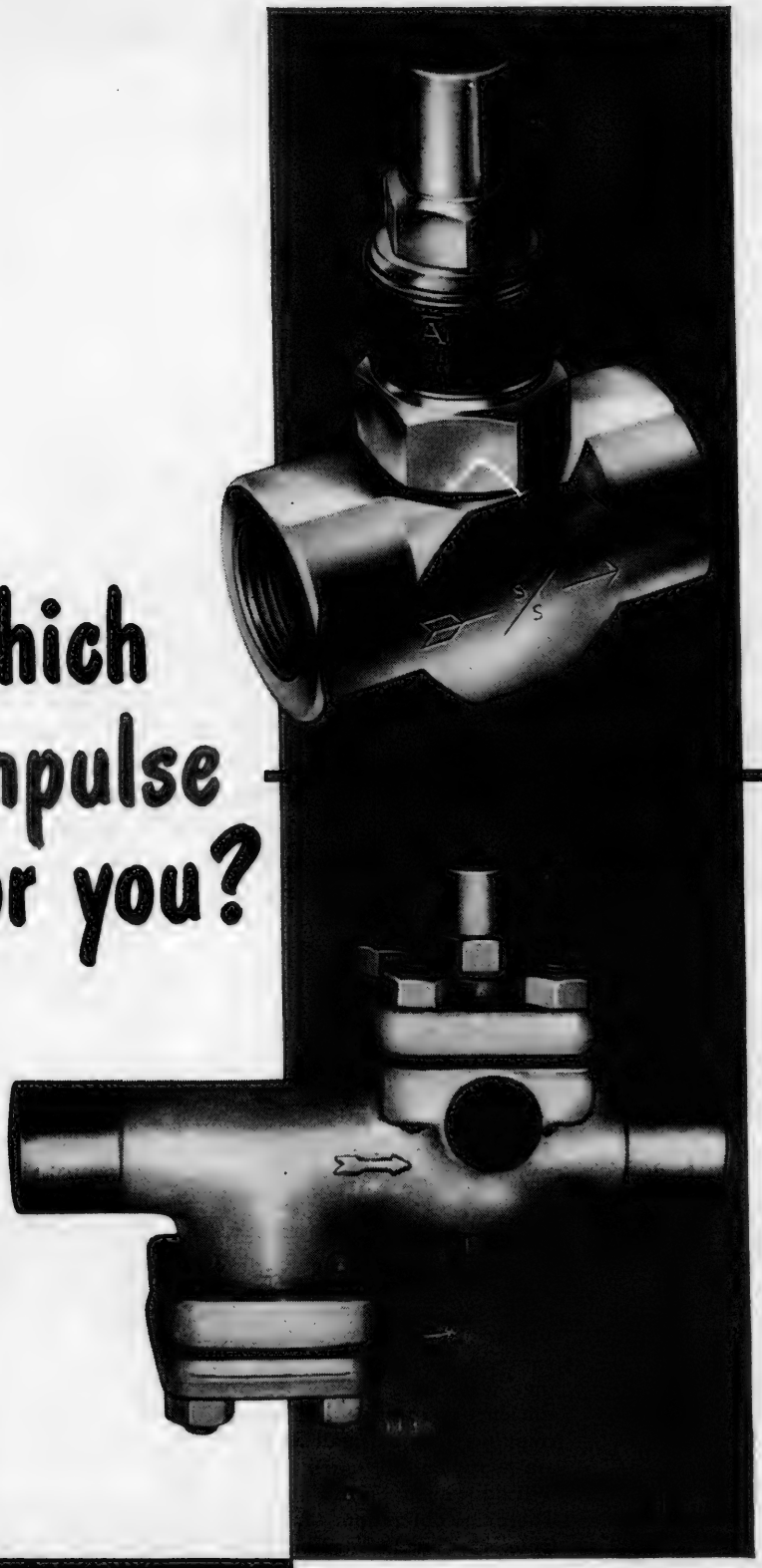
LORD & TAYLOR'S new West Hartford, Conn., store depends on Worthington to provide comfortable air conditioning for its customers. Two 150 hp "J" compressors and two evaporative condensers make up the highly efficient Worthington air conditioning team at this modern store.

A.4.33

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

which impulse for you?



STANDARD

The standard YARWAY Impulse Steam Trap serves all normal trapping requirements. Factory set to operate without adjustment at all pressures from 20 psi to 400 psi (Series 60) and 600 psi (Series 120). For pressures below 20 psi, merely remove split washer.

Numerous advantages like:

small size
quick heating
steady temperatures
stainless steel construction
one moving part
non-freezing
low cost

More than 900,000 used throughout industry.

Write for YARWAY Bulletin T-1740.

HIGH PRESSURE, INTEGRAL STRAINER

YARWAY Integral Strainer High Pressure Impulse Steam Traps operate on some of the highest pressure steam lines in the country. Same operating principle as the standard YARWAY Impulse Trap. Strainer built into trap.

Ample capacity when system is being "warmed up"—yet will handle relatively small amounts of high temperature condensate without losing prime. Six sizes—½" to 2". Pressures to 1500 psi (flanged ends) or 2500 psi (welding ends).

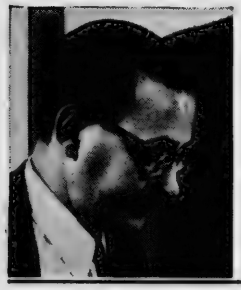
Write for YARWAY Bulletin T-1740.

YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.

impulse steam traps

YARWAY Impulse Steam Traps and Fine Screen Strainers are stocked and sold by more than 250 convenient local distributors. Write for name of one nearest you.

Random Thoughts from a Filter Engineer



by Richard E. Brown

- **ENGINEERS DO HAVE IMAGINATION!**
- **HOW TO EVALUATE FILTER "TESTS" OR PROOF POSITIVE OF WHAT?**
- **WHY THE HIGHEST EFFICIENCY FILTER ISN'T ALWAYS THE BEST**

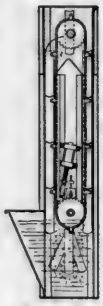
ENGINEERS DO HAVE IMAGINATION!

It's fashionable these days to accuse us engineers of not being able to see beyond our slip sticks. We're supposed to be great when it comes to exact calculations but not much when imagination is needed. Don't believe it. Engineers, like writers, are often inspired to real creation. Call it a creative hunch, if you like, but it definitely exists.

For instance, we're proud of a bit of inspiration one member of our engineering department came up with. The idea of a self-cleaning, curtain type filter is not new. But the idea behind Air-Maze's new cleaning action—called "pulse-type" action—*is* new.

All self-cleaning filters submerge each panel of the revolving curtain in a cleaning tank at the bottom. But Automaze, (below right), Air-Maze's new self-cleaning filter, goes a step further. It vigorously agitates each panel 6 or more times in the oil bath, gets it *really* clean.

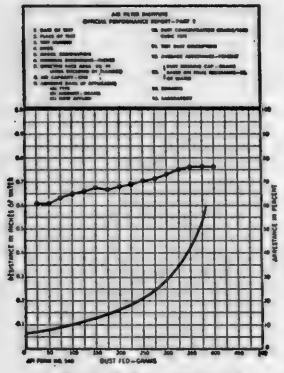
The problem was to find a way of forcefully moving each panel back and forth in the oil bath so that it would be thoroughly cleaned. The solution: a compressed air drive that gives exactly the quick, forceful motion required. It's an Air-Maze exclusive. And a good example, we think, of the kind of imagination that filter users have come to expect from Air-Maze.



Automaze

HOW TO EVALUATE FILTER "TESTS" OR PROOF POSITIVE OF WHAT?

You've probably seen the results of a good many filter tests. There's hardly a filter manufacturer who would be caught dead without a briefcaseful. And each company is setting out to prove with tests that "our" filter will trap more dust than the next fellow's.



Typical Standardized AFI Test Form

If you try *comparing* these test results you may wind up a little dizzy from the effort because hardly any two manufacturers run tests under identical conditions. It's something like comparing apples and oranges. Particularly since many different types of test dust are used.

You may have wondered, as we have, why all the manufacturers of "mechanical" type filters don't use the same test procedure. Here at Air-Maze, we've installed the equipment designed by the Air Filter Institute and use the A. F. I. standardized test dust for all filters except our electrostatic precipitators (which we test with the National Bureau of Standards Discoloration Method, using atmospheric dust). It's our hope that more of the other filter companies will follow suit—to make your job easier when specifying filters.

Tests serve a useful purpose in filter design and Air-Maze makes plenty of them. In the final analysis, though, there are only two things that really determine a filter's value. One is the reputation of the makers. The other, and most important, is the experience of users over a long period of time.

WHY THE HIGHEST EFFICIENCY FILTER ISN'T ALWAYS THE BEST

It's no problem at all to build a filter that's efficient enough to stop almost all air-borne particles. But usually, as you add efficiency, you have to cut dirt-holding capacity, or increase air-resistance or raise costs.

The ideal filter is the one that has the right combination of advantages to solve a particular filtering problem—not necessarily the one with the highest efficiency.

It's like buying a car on gasoline mileage alone. You'll probably have to sacrifice roomy interiors, high horsepower, roadability, or other things you want. The question will be to decide what combination of advantages best suits your needs.

Electromaze

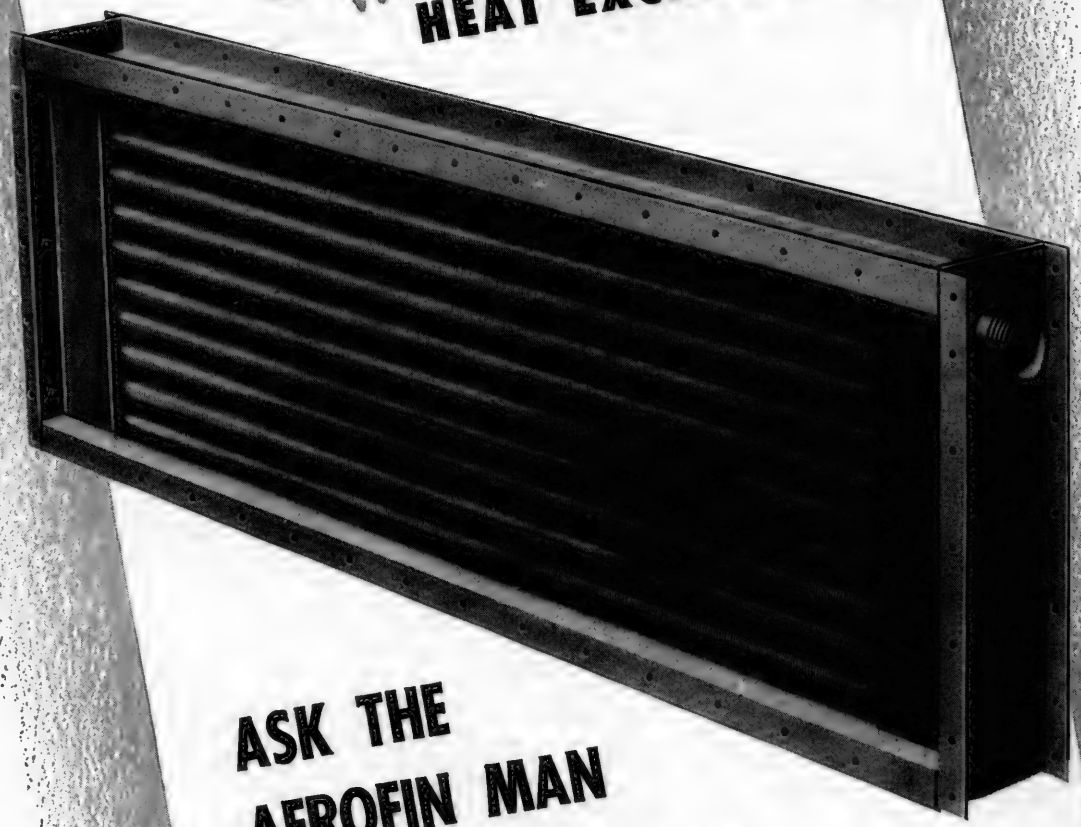
It may not take an expert to help you pick the right car. But we think you'll do better to call on expert advice the next time you buy filters. We at Air-Maze have 29 years experience in giving people what they want in a filter. If it's high efficiency you want, we offer the Electromaze (above) which traps particles as small as 1/250,000 of an inch! Yet we are happy to sell you the inexpensive Kleenflo filter if it will do the job. So call on us if you have a filter problem. There's no obligation. Air-Maze Corporation, Cleveland 28, Ohio. In Canada, Masdom Corp., Montreal and Toronto, Fleck Bros., Vancouver.

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

*FIRST LINE *Extended-Surface* HEAT EXCHANGERS



ASK THE AEROFIN MAN

Specify Aerofin and you specify high efficiency, long service life and low maintenance and service costs.

Take advantage of Aerofin's unequalled experience, production facilities, and materials-testing and design research—of Aerofin's complete engineering service at the plant and in the field.

Ask the Aerofin man.

*Aerofin makes extended heat surface exclusively — not as a by-product, not as a side-line. Sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION
101 Greenway Ave., Syracuse 1, N. Y.

Depend on LADISH

To Meet All Your Fittings Needs With an Unsurpassed Range of Sizes and Materials

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TO MARK PROGRESS

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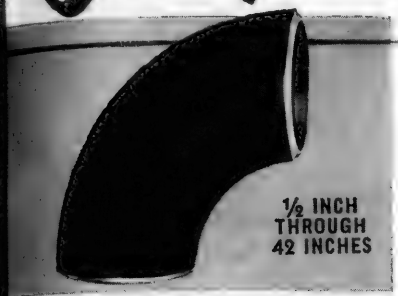

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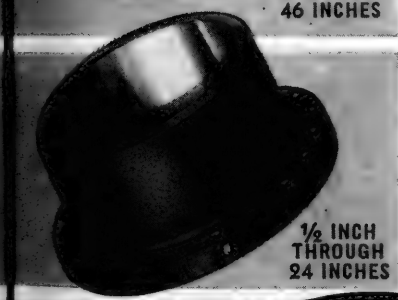

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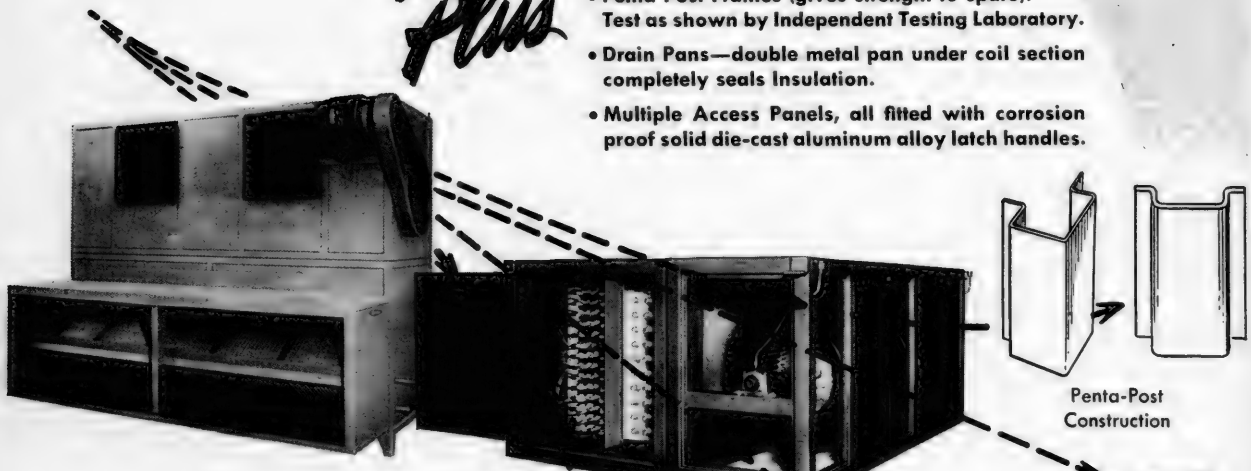

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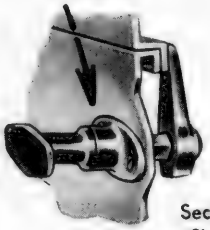

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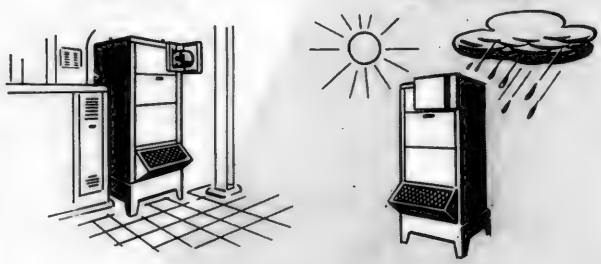

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- Saves Erection Time and Cost
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- Handles Quick Load Changes
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- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Satisfaction with the performance of the B&W Type FM Boiler is proved by the number of units in service and on order for industries, utilities, and other users in practically every category. In terms of total steam capacity they add up to about 9,000,000 lb per hr, and better than half of this capacity is in multiple-unit installations. The compact, shop-assembled FM is available in standard sizes for loads ranging from 2900 to 36,000 lb per hr at steam pressures to 235 psi—is also available for higher pressures.

Bulletin G-76A describes in detail the many cost-saving features of this self-contained, popular small boiler. Write for your copy. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

G-642

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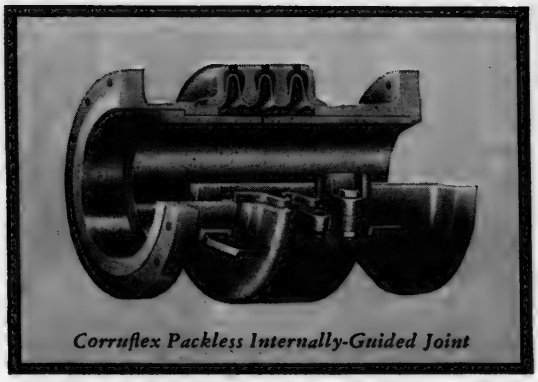

Corruflex Packless Internally-Guided Joint

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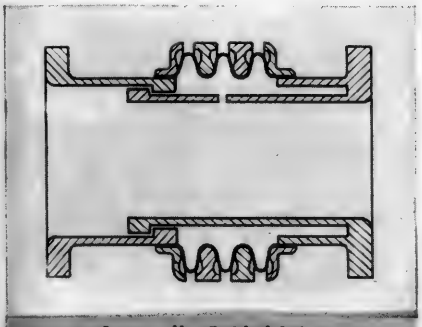
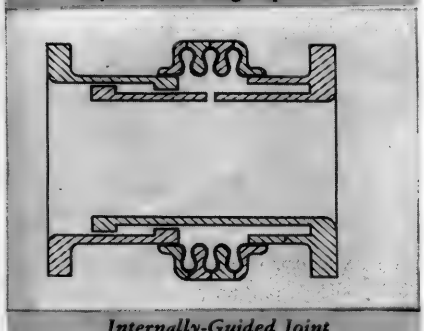
THE *Corruflex* INTERNALLY-GUIDED JOINT



Internally-Guided Joint Before Absorbing Expansion



Internally-Guided Joint After Absorbing Expansion

One of many reasons why Corruflex Packless Expansion Joints are so widely used by progressive engineers is the completeness of the Corruflex line. There is a Corruflex joint to absorb pipe expansion under *any* piping condition.

Suppose an engineer wants a joint which provides rigid construction against all movement except axial movement. ADSCO has the perfect solution — the Corruflex Internally-Guided Expansion Joint. No maintenance required because it is packless. Joint is built with an internal sleeve of heavy wall construction for effective guiding. Inner end of sleeve has a guide ring riding on a machined bore to insure true axial movement. Limit stop prevents the joint from being extended beyond its predetermined limit.

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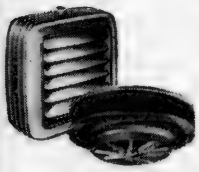
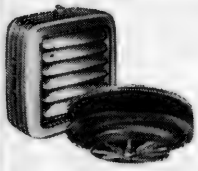


Modine builds 13 sizes of vertical delivery units with choice of 5 easily attached optional deflectors. Horizontals in 19 standard and low-outlet temperature models.

HOT WATER



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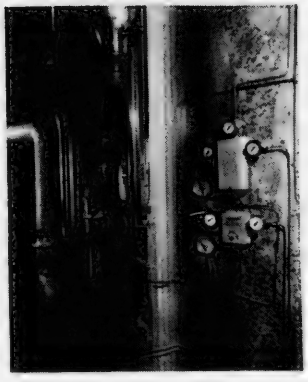
Modine UNIT HEATERS



Johnson D-251 Damper Operators, controlled by T-400 Thermostats in the store, regulate Mixing Dampers on each of four central fan air conditioning units.

Temperature of the cool air plenum of this unit is controlled by a Johnson T-800 Capillary Thermostat, while a T-901 Submaster Thermostat, controlling a V-103 Steam Valve on the heating coil, regulates the temperature of the warm air plenum.

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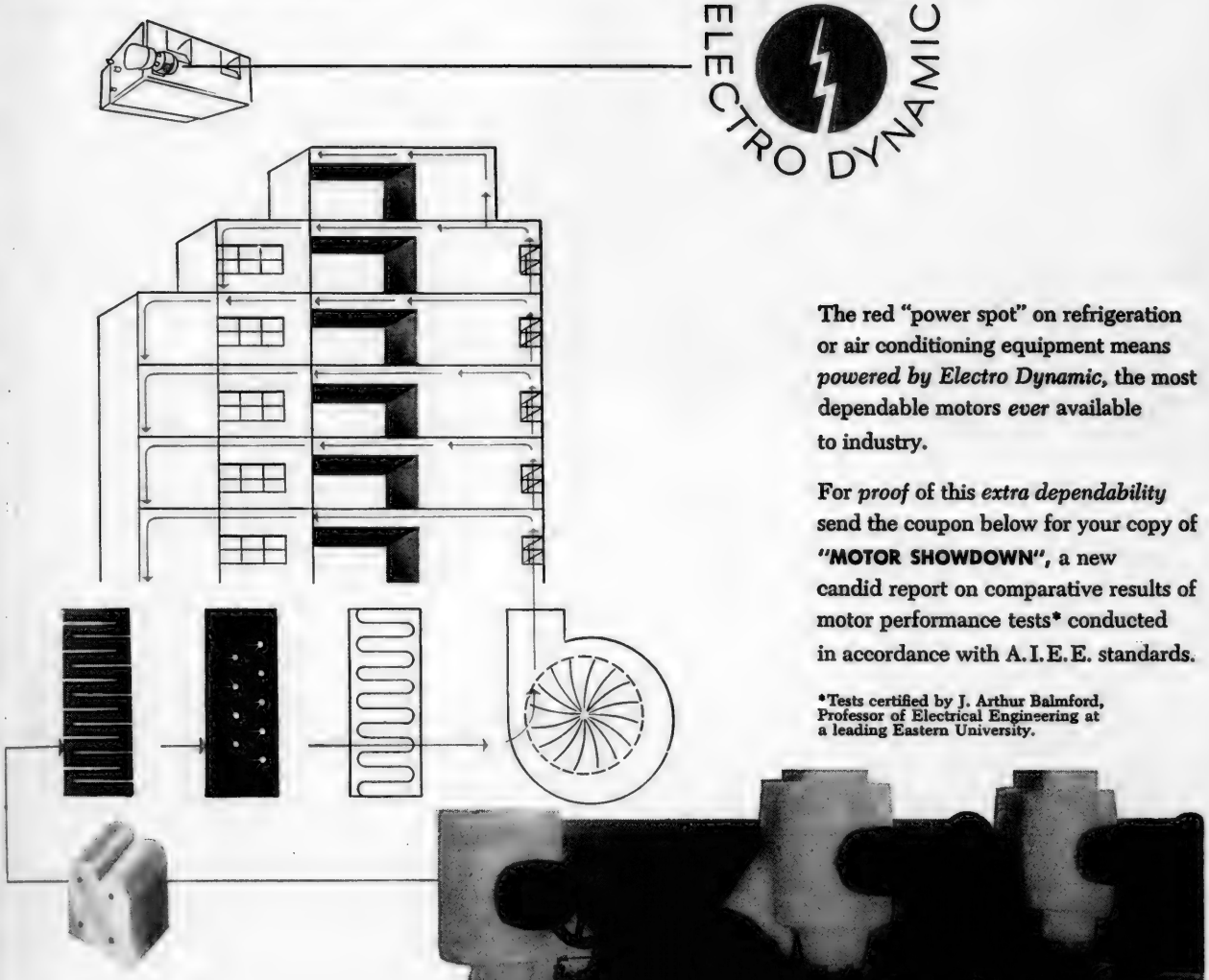

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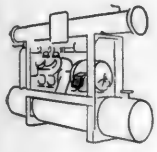

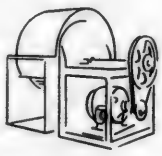

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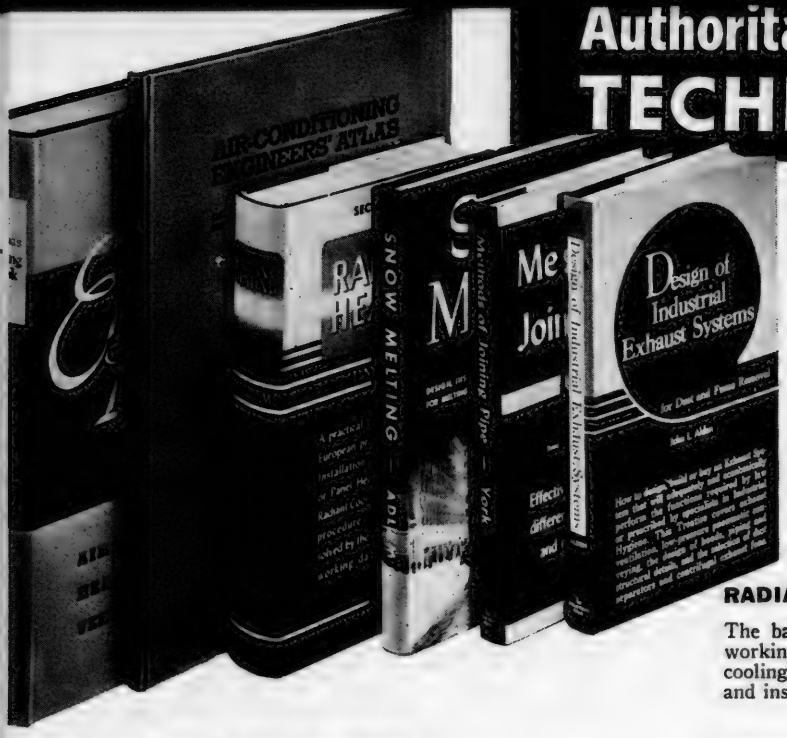

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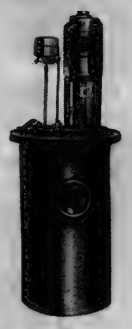

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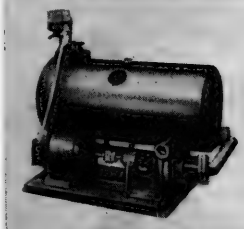

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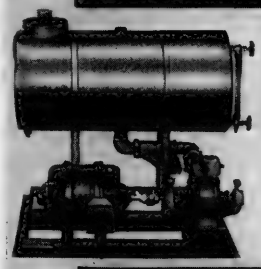

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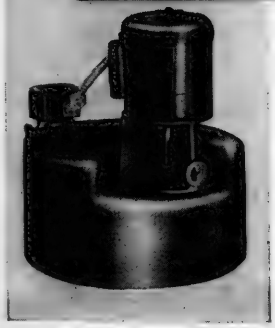
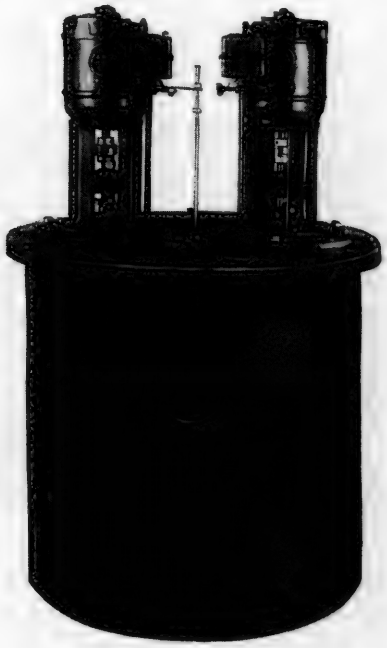


TYPE CV

Type CV Vertical Pump is ideal where space is limited. This model like every Skidmore Pump is built to meet specific requirements. For the correct solution to your own pump problem consult a Skidmore Heating Pump Specialist.

Write for *Bulletin No. 21*



Alert-minded . . . engineers and contractors who are value and maintenance-wise are "all eyes" on Skidmore Pumps. Men *who know* are quick to spot the many advantages that only dependable Skidmore Pumps can offer — whatever your heating pump installation requirement — look at Skidmore *first!*

TYPE "UV" — Available in duplex and single units — recommended for below floor level returns. Unit is bolted to sump type receiver. Capacities ranging from 2,000 to 40,000 sq. ft. E.D.R. and discharge pressures from 10 to 75 pounds.

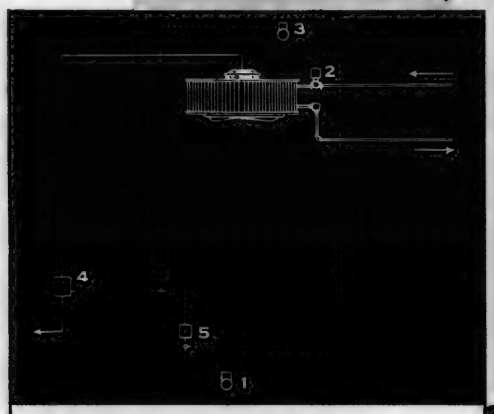
Skidmore Pumps have set a Standard of performance and dependability since 1921

SKIDMORE PUMPS

SKIDMORE CORPORATION
ST. JOSEPH, MICHIGAN

PROJECTION HEATER PULLS IN

How Trane waste ceiling heat to warm



Dual control system is heart of patented TRANE Temperature Equalizing System, equalizes floor and ceiling temperatures in this typical installation. When floor thermostat (1) calls for heat, steam valve (2) opens and fans are turned on. As floor temperature approaches comfort level, steam is turned off. Fans, however, continue to run, driving trapped ceiling heat to floor, until ceiling thermostat (3) signals "free" heat is exhausted. Magnetic switch (4) and relay switch (5) interconnect component parts, control switching operations.

WARM AIR TRAPPED BY HIGH CEILING, PUSHES IT BACK TO FLOOR LEVEL

Projection Heaters harness floors, cut fuel costs!

Heaters operate much of the time without using steam!
Exclusive temperature equalizing system drives heat trapped by high ceilings down to worker level, prevents stratification!

Warm air trapped in "heat hungry" high ceilings can be driven back down to the floor again by TRANE Projection Heaters . . . automatically.

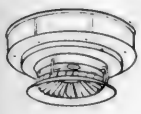
With the exclusive TRANE Temperature Equalizing System in operation, ceiling thermostats permit the heater fans to salvage warm ceiling air, push it down to floor level. Floor thermostats turn on the steam only when the "free" heat near the ceiling has been used. Heaters operate part of the time *without using steam!* Stratification is eliminated, fuel costs are cut substantially.

Besides salvaging ceiling heat, you can put heat *exactly where you need it* with TRANE Projection Heaters.

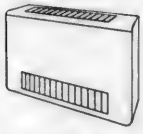
Exclusive patented TRANE Louver Cone Diffusers permit you to divide the air stream . . . spread it . . . or concentrate it into a narrow column for *up to 60% greater throw* so that the heaters can be mounted high above overhead craneways and other obstructions.

If high ceiling heat waste is *your* problem, contact your nearest TRANE Sales Office for additional information. Ask for free bulletin DS-327B or write TRANE, La Crosse, Wisconsin.

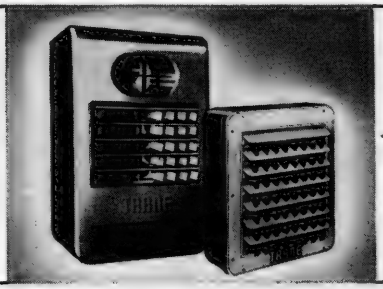
There's a Trane unit heater for every heating need



Projection Heater

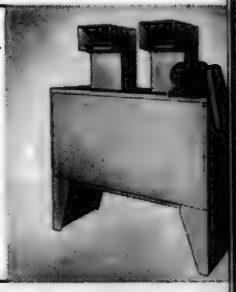


Force-Flo Heater



Trane Torridor blower-type unit delivers large volumes of heated air long distances, with or without ducts.

Trane Horizontal Heaters put heat *where* you want it, *when* you want it. Both conventional Model H and new Gas-Fired Unit Heater have patented TRANE Louver Fin Diffuser.



one source · one responsibility

Install TRANE Unit Heaters

to put heat where you want it at low cost

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT
The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 15 Canadian Offices

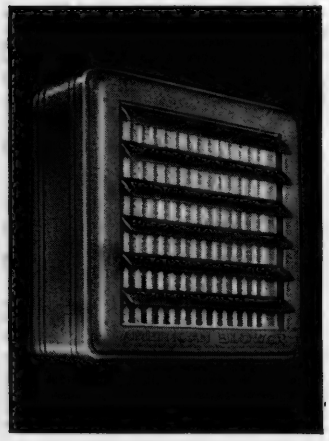
Choose the heater that fits your job best!

American Blower offers you a *complete line* of commercial and industrial unitary-type heaters for maximum flexibility in layout and design!

Looking for an attractive and efficient unit heater for your lobby? Office? Showroom? Corridor? Then install American Blower **De Luxe Cabinet Unit Heaters** for steam and hot-water systems! Recessed and non-recessed types for ceiling or floor installation. Finished in attractive gray-green baked enamel. Five basic sizes; permanent or disposable filters.

You can't go wrong if you (1) plan to use gas as fuel on your next heating installation, and (2) use American Blower **Gas-Fired Unit Heaters!** They're compact and modern in design; come in both conventional and duct types, to let you tackle any size job. Use them individually or in combination; easy to install, economical to operate. Capacities: 50,000 to 230,000 BTU/hr input.

Equitemp Air Diffuser on new **Venturafin Vertical Unit Heaters** is adjustable, and permits an even flow of heat. It produces a cone of heated air that mixes with room air—for breathing-level temperatures that vary less than one degree! Anemostat and vane-type diffusers also available. 58,400 to 560,000 BTU at 2 psig, 60°F. entering air.



If you want *both* low price and top heating performance, put in American Blower's new **Venturafin Horizontal Unit Heaters!** They're truly quiet, and have separate coil systems for hot water and steam. Serpentine design of hot-water coils increases output; permits use of smaller units in many cases. Capacities: 18,000 to 357,500 BTU at 2 psig, 60°F. entering air.

* * *

For complete data on American Blower unitary-type heaters, jot down your request on a post card and mail it to: American Blower Corporation, Detroit 32, Mich. Better yet, step into your American Blower jobber's and see them for yourself—today!

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

First in flanges—

No organization has been so closely identified with the development of forged steel flanges as Taylor Forge. No organization or individual has had so much to do with the study of design, strength, bolting practices, and the establishing of flange standards.

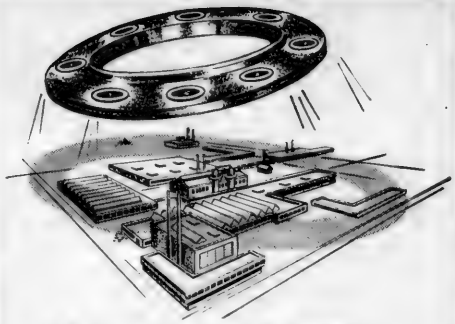
Taylor Forge started first and has remained first . . . in scope of flange types, sizes, weights, and materials . . . in volume produced.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois

Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada



A flange with a future—

Even though no one knew it at the time, the year 1905 was a significant year for Taylor Forge.

It was the year that Taylor Forge began the making of forged steel flanges.

The beginning was modest enough. Taylor Forge simply started out to make flanges for Taylor Spiral Pipe because the only flanges then available — cast iron flanges—had proved unsatisfactory. But it was soon apparent that the men at Taylor Forge had built better than they knew. In just a few years, the new and stronger Taylor Forge Flanges were in demand everywhere—not just for Taylor pipe, but for all types of pipe used by U. S. industry.

It was also apparent that the forging of flanges had taken Taylor Forge into the dawning field of designed piping. Pressures were beginning to climb. Knowledge of how to contain them was needed. By 1920, the late J. Hall Taylor and his associates began the intensive research that was to make Taylor Forge not only the world's largest manufacturer of forged steel flanges, but also the foremost contributor to flange design and standards.

In the mid-20's, big strides were made in flange development to meet the broadened needs of the growing petroleum industry. By 1927, as the reward of long, intensive research, the authoritative Taylor-Waters formula was published. This research work demonstrated the design advantages of the hub type flange and provided the means for producing flanges accurately proportioned for strength combined with economy.

Most of this research had been concerned with the American Standards—flange sizes through 24"—but in 1938 Taylor Forge published the first edition of its widely consulted "Modern Flange Design," based on methods proposed by E. O. Waters, D. B. Rossheim, D. B. Wesstrom and F. S. G. Williams, manager engineering standards, Taylor Forge (ASME Trans. Apr. 1937). It provided the first complete analyses of the effects of tapered hubs on flange strength and thus opened the way to predetermine design requirements of flanges of all types.

(An episode in the story of Taylor Forge leadership in designed piping)

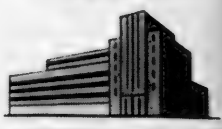
Forty years of research made this book possible. It is available to those interested in flange design.

TEST OF TIME

LAWLER'S longer lasting quality insures YOUR reputation!

IN FACTORIES

POWER PLANTS



COMMERCIAL BUILDINGS

PROCESSING PLANTS

DAIRIES

INSTITUTIONS

SHIPS

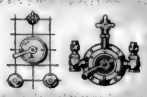
. . . Wherever Steam is Used

Type "S" Thermostatic Temperature Regulator for automatically regulating the flow of liquid or steam through a valve, such as in the steam tables illustrated above.

Lawler's "Performance-Tested" design combines pioneering experience with engineering leadership. The use of specially chosen metals assure YOUR customers years of positive, accurate temperature control with lowest maintenance cost . . . the best insurance YOUR REPUTATION can have.

"Performance Tested" for Longer Life

STEAM TEMPERATURE REGULATORS



SHOWER MIXING VALVES

WATER CONTROLLERS

TEMPERING VALVES

the Lawler Line **of Thermostatic Controls**

LAWLER AUTOMATIC CONTROLS, INC. 453 North MacQuesten Parkway, Mount Vernon, N. Y.

Anemostat high velocity units

HAVE DESIGNS ON SPACE

Floor to floor height can be kept to a *minimum* and usable floor space to a *maximum* with Anemostat High Velocity Air Conditioning. • HV units, used with smaller than conventional ducts, save space, and money too. They substantially reduce pounds of sheet metal required, can be installed faster, with less labor. • HV Manual 48 contains specification data on 7 types of Anemostat High Velocity units, for all engineering and architectural requirements. Write for free copy.

ANEMOSTAT®

DRAFTLESS *Aspirating* **AIR DIFFUSERS**

ANEMOSTAT CORPORATION OF AMERICA

10 EAST 39th STREET, NEW YORK 16, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

"No Air Conditioning System Is Better Than Its Air Distribution"

The most convincing stamp of user satisfaction

ANOTHER REPEAT ORDER FOR SARCO

Susquehannock Junior-Senior High School Southern York County, Pa. *Architect:* Buchart Engineering Corp. *Engineers:* W. K. Hood & Associates. *Heating Contractors:* J. L. Thomas. *Plumbing Contractors:* C. C. Kottcamp & Son.

21 times in two years

Buchart Engineering Corporation Specifies Sarco Heating Specialties for School Projects

PLAIN TALK! Here's what the Buchart Engineering Corp., York, Pa., School Designers, has to say about the dependability of Sarco Heating Specialties:

"...all our school projects equipped with Sarco traps, temperature regulators, water blenders and heating specialties have had satisfactory, dependable service throughout the years."

Sound reason why Sarco products were specified and installed in 21 schools designed by the firm during the last two years.

This record of confidence is convincing testimony to the dependability of Sarco Heating Specialties.

Why not specify Sarco on *your* next project and be assured of the same dependable performance.

Full information on all Sarco products is available on request. SARCO COMPANY, INC., Empire State Building, New York 1, N. Y. Representatives in principal cities.

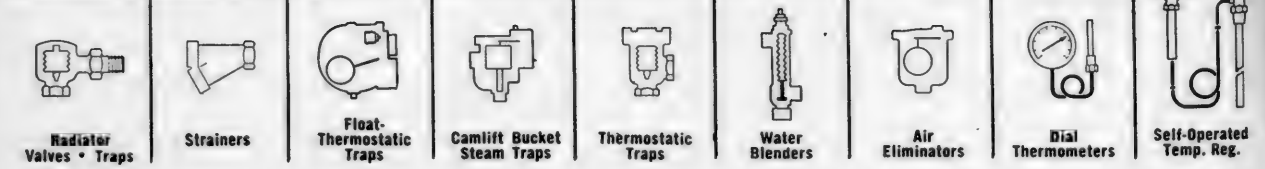
SARCO

Sarco quality assures satisfaction

HERE ARE THE 21 BUCHART-DESIGNED PENNSYLVANIA SCHOOLS RELYING ON SARCO HEATING SPECIALTIES

- Kennard-Dale Junior-Senior High School
- Susquehannock Junior-Senior High School
- York Township Elementary School
- Red Lion High School
- Spring Grove Elementary School
- Dover Joint Elementary School
- Southampton Township Elementary School
- Quarryville Boro Elementary School
- Springettsbury Township Elementary School
- Spring Grove Joint High School
- Jefferson Elementary School
- McConnellsburg-Ayr-Todd Elementary School
- Union-East Buffalo Elementary School
- Pequea Township Elementary School
- Mt. Rose Junior-Senior High School
- Kennard-Dale Junior-Senior High School Addition
- Stewartstown Elementary School Addition
- Windsor Township Elementary School
- Jackson Township Elementary School
- New Salem Elementary Center
- Springettsbury Independent Elementary School Addition

STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES



Radiator Valves • Traps | Strainers | Float-Thermostatic Traps | Camlift Bucket Steam Traps | Thermostatic Traps | Water Blenders | Air Eliminators | Dial Thermometers | Self-Operated Temp. Reg.

Sound-room tests prove TRI 55 CLAD motors operate at greatly reduced noise level!

REG. U.S. PAT. OFF.

Here's the new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact G-E Tri/Clad '55' motor, in ratings from 1 to 30 hp a-c.

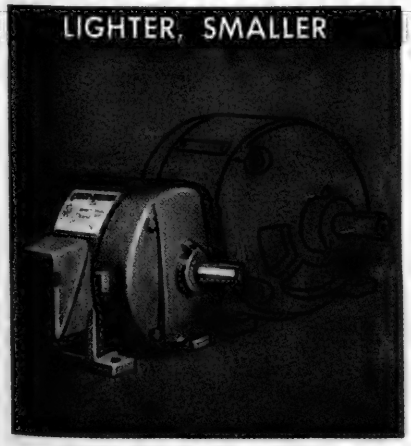
To reduce noise, G. E. engineers developed a new concept —a sonant motor—a motor that sounds pleasing to the ear. They studied, and then reduced, the causes of motor noise—bearing rattle, magnetic hum, and windage. Sound room tests prove the Tri/Clad '55' is sonant, runs quieter.

In addition, the modern looking Tri/Clad '55' motor is lighter and smaller—saves weight, saves space.

Try this new motor. See for yourself how the Tri/Clad '55' can help reduce noise and save space in your own equipment. Contact your G-E Apparatus Sales Office or G-E Motor Supplier today. For bulletins, write General Electric Co., Section 648-12, Schenectady 5, New York.

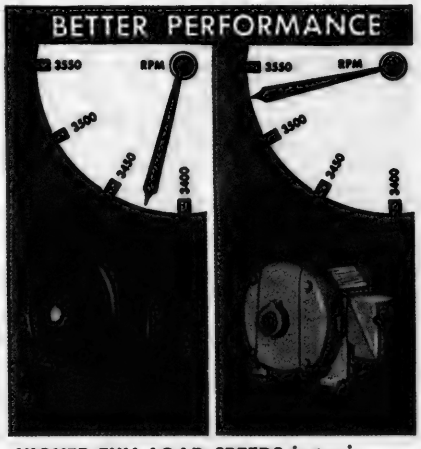
Progress is our most important product

GENERAL ELECTRIC



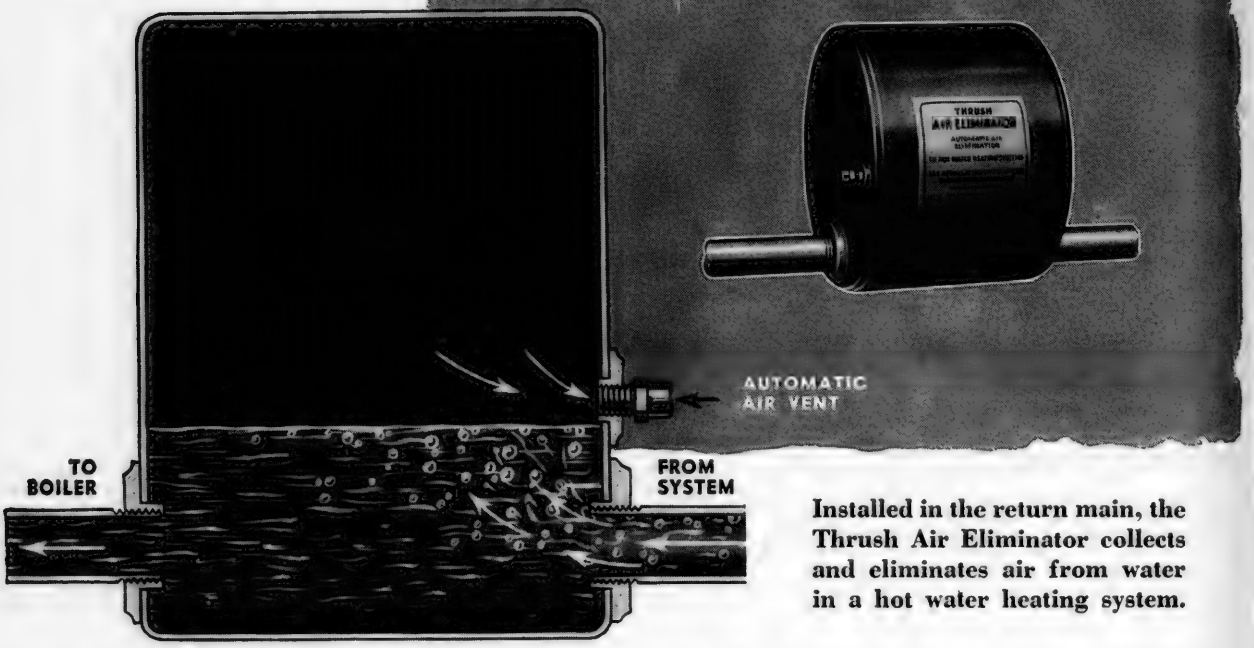
MORE COMPACT MOTOR means more horsepower per pound—saves space, weight—is easier to handle.

SILICONE RESIN COATING on stator plus stronger polyester-film slot and phase insulation increase electrical life.



HIGHER FULL LOAD SPEEDS is typical of many performance improvements in the new Tri/Clad '55' motor.

END *Air Troubles*
IN HOT WATER HEATING

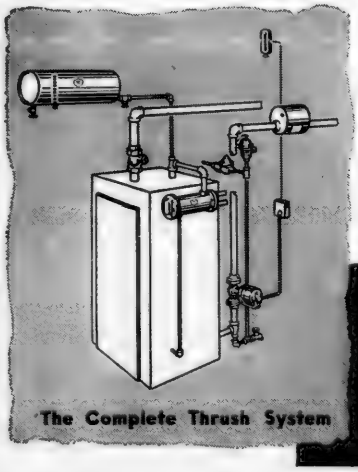


Installed in the return main, the Thrush Air Eliminator collects and eliminates air from water in a hot water heating system.

THRUSH AIR ELIMINATOR

removes air from hot water systems!

THE NEW THRUSH Air Eliminator provides a simple, inexpensive but highly efficient means of collecting and automatically removing air from radiant coils, baseboards or convectors. Air in water moves with circulation and is trapped and released in the Eliminator, thus preventing air from interfering with circulation. This operation is accomplished by breaking the flow of water, which causes air to separate from the water.

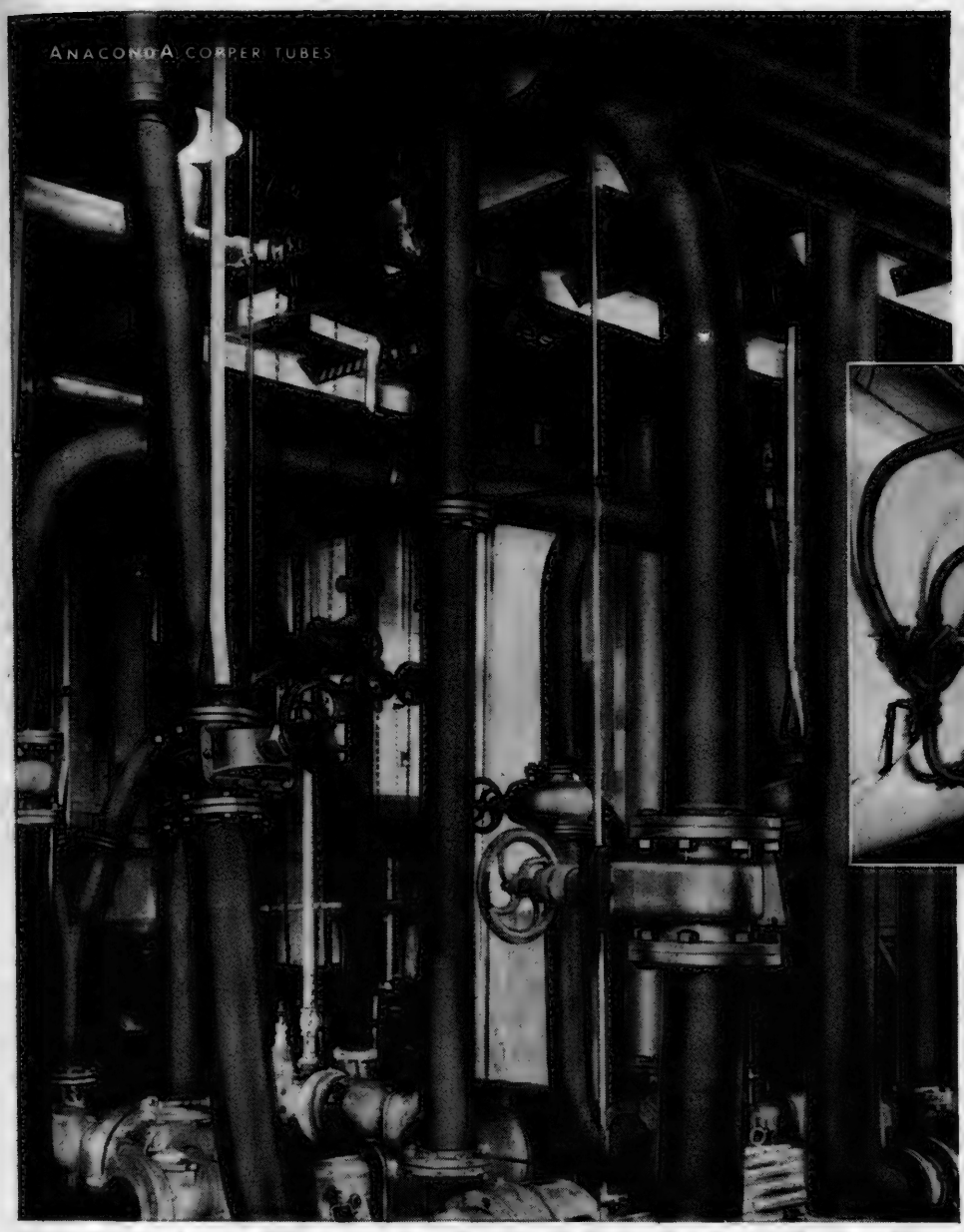


The Complete Thrush System

The Thrush Air Eliminator is easy to install in the return main as shown in the system diagram below. It is ruggedly constructed. Each Air Eliminator is shipped in an individual carton, with full instructions.

For real customer satisfaction, install complete Thrush Radiant Hot Water Heat as shown in the illustration at left. For more information see your wholesaler today or write Dept. D-9.

H. A. THRUSH & COMPANY
PERU, INDIANA



PUMPING ROOM of Liebmann Breweries, Inc., Brooklyn, N. Y. Notice the smooth bends and braze into main line (at top of picture). These are the kinds of savings you get with ANACONDA Copper Tubes.

FINISHED BEER is fed through 2-in. ANACONDA Copper Tubes to bottling room.

VERSATILE COPPER:

Efficient, economical piping for brewers of Rheingold Beer

In the pictures above you'll find numerous reasons why ANACONDA *Copper Tube* pipelines are *economy* pipelines. They adapt easily to any plant layout and equipment. Long lengths of lightweight ANACONDA Copper Tubes speed assembly, too. They may be bent so you can clear beams, girders and other obstructions—without extra joints and fittings. And fewer fittings mean less flow resistance, lower pumping costs. ANACONDA Copper Tubes with solder-type fittings also permit you to make sound, economical connections. You can also dismantle and reassemble *copper* tube lines easily to meet changing plant conditions.

ANACONDA Copper Tubes are strong, rustproof and corrosion-resistant. They remain smooth and clean inside.

For reliable service on ANACONDA Copper and Copper Alloys—consult your Anaconda Distributor.

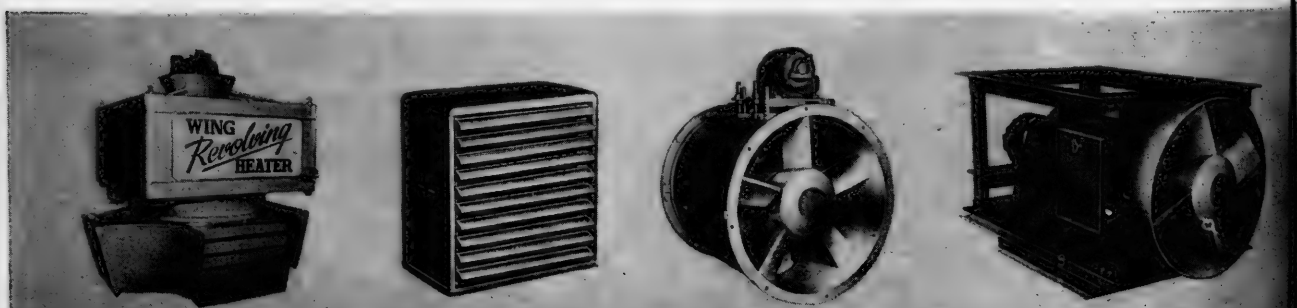
Write for free booklet, "ANACONDA Copper Tubes for Industrial Applications" to *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 5332 (Rev.)

ANACONDA®

Makers of copper tubes for industrial processing, water, heating, soil, waste and vent lines; welding rods; flexible metal hose and tubing; heat exchanger tubes; bus conductors; sheet copper; refrigeration products.

In 1879, it was the new "Wing's Disc Fan"

It was 75 years ago that L. J. Wing, an ingenious Yankee who had come to New York with some ideas about mechanical devices, formed the company which later became the L. J. Wing Mfg. Co., for the purpose of manufacturing and selling "Wing's Disc Fan" which, according to his catalog, would "move more air than any other Fan made for heating, ventilation, drying, etc., as competitive trials have shown". Today, Wing products for ventilation, heating and combustion are known for their efficiency and dependability in all parts of the world. The company Mr. Wing founded has kept his ideals of originality and excellence constantly before them.



REVOLVING UNIT HEATER · UTILITY UNIT HEATER · STRAIGHT LINE DUCT FAN · ELBOW DUCT FAN

today, Wing Fans, Blowers, Unit Heaters, Draft Inducers and Turbines are serving industry the world over

OUR 75TH YEAR
1879 1954

L. J. Wing Mfg. Co.

Linden • New Jersey

FACTORIES:
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ETABLISSEMENT WANSON
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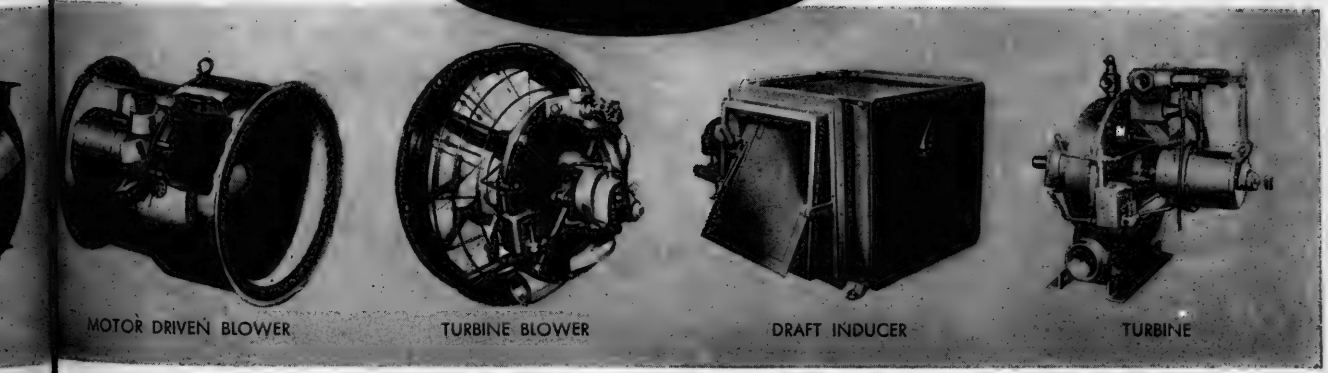


MOTOR DRIVEN BLOWER | TURBINE BLOWER | DRAFT INDUCER | TURBINE

for Rust-Free Hot Water look for the Copper Lining

they did at the New 525 Wm. Penn Place Building

Take a tip from men who specify hot water storage heaters for America's important buildings: "look for the p·k copper lining."

High above Pittsburgh's famed Golden Triangle, towers a glistening new skyscraper. This magnificent 41 story structure houses the main offices of the United States Steel Corporation and the Mellon Banking interests. From tower to basement, 10 p·k copper-lined storage heaters provide an abundant supply of rust-free hot water.

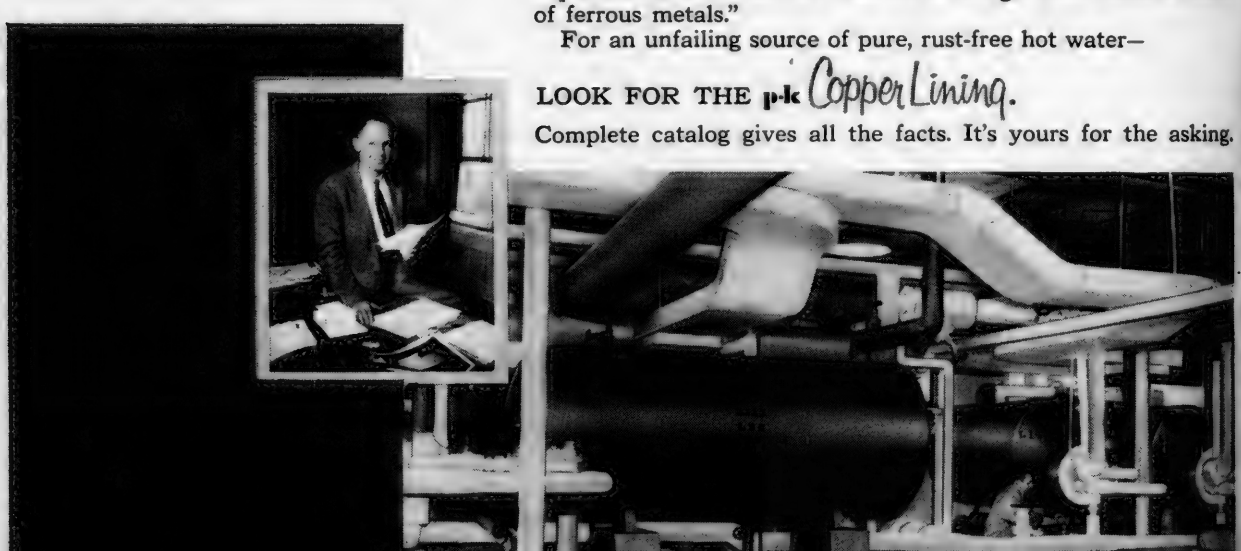
These heaters have been in operation since the building opened in 1952. Because of the corrosiveness of water in the area, the performance record of the heaters is already noteworthy.

Paul L. Flemm, Building Engineer, is enthusiastic about p·k heater operation. "Heating water costs money. Trouble-free operation keeps costs down. We haven't had a single case of trouble with the p·k heaters . . . to date no cause to expect any. We . . . expect much better service than we would get from heaters made of ferrous metals."

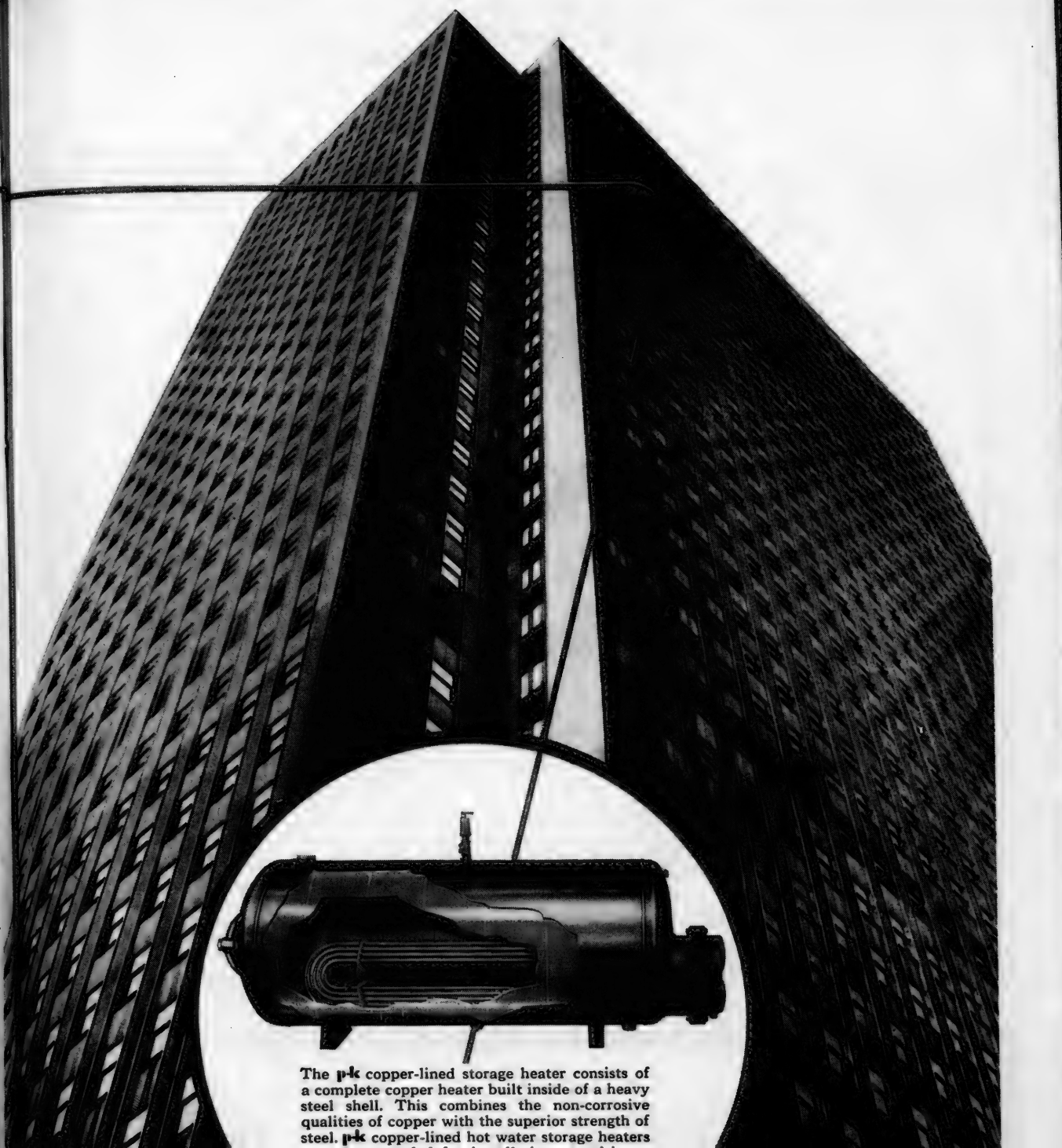
For an unfailing source of pure, rust-free hot water—

LOOK FOR THE p·k Copper Lining.

Complete catalog gives all the facts. It's yours for the asking.

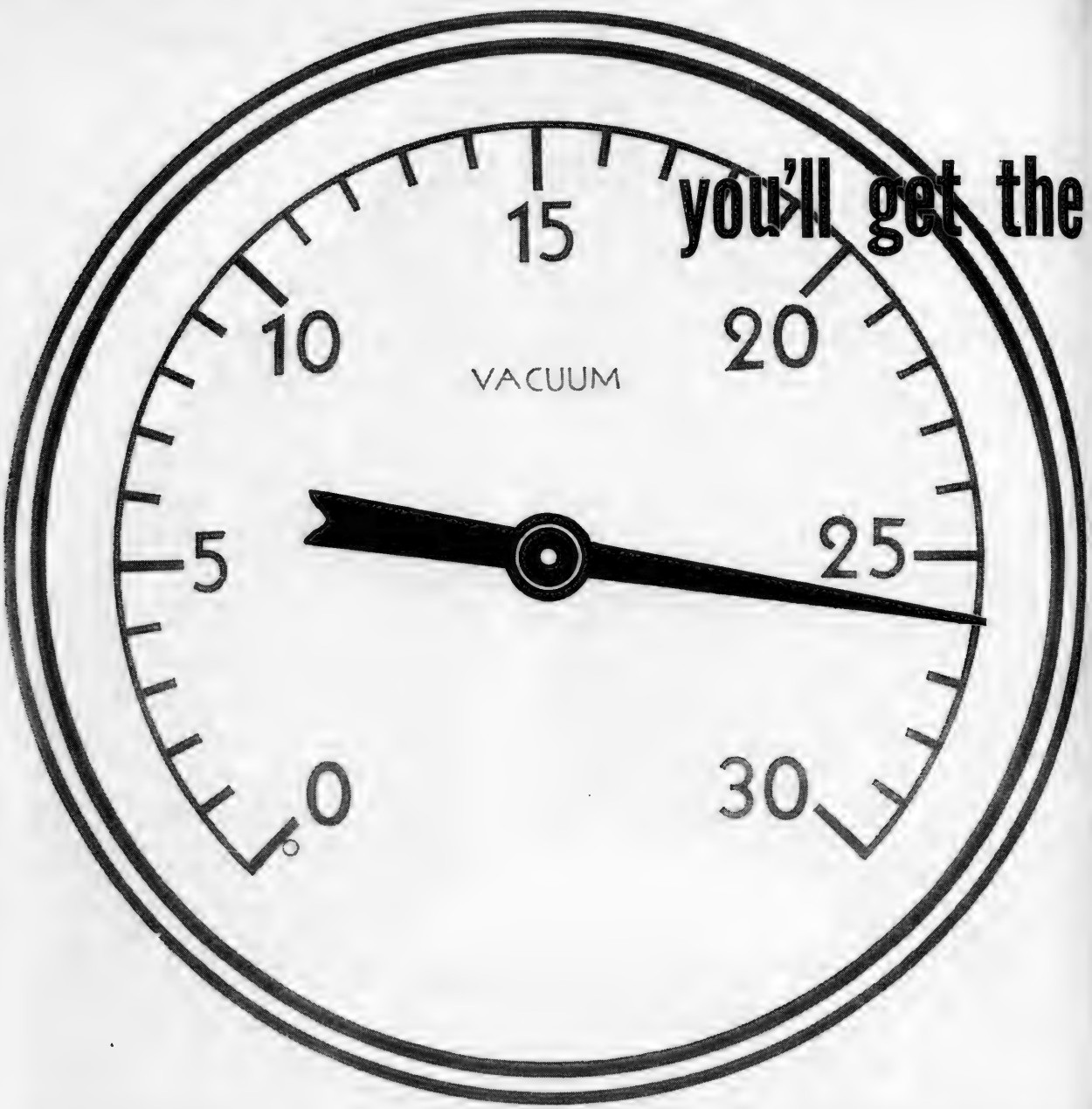


MOTOR DRIVEN BLOWER TURBINE BLOWER DRAFT INDUCER TURBINE



The p-k copper-lined storage heater consists of a complete copper heater built inside of a heavy steel shell. This combines the non-corrosive qualities of copper with the superior strength of steel. p-k copper-lined hot water storage heaters

990 Burson Street, East Stroudsburg, Penn.



you'll get the

FROM RADIATOR TRAPS

same reading ten years from today

Dunham Vacuum Heating Pump
Single and Duplex models for
capacities from 2,500 through 65,000 EDR

Read "behind" this vacuum gauge, and you'll see that Dunham Vacuum Heating Pumps perform as rated year after year, in properly installed and serviced systems, without expensive repairs—at low amperage.

That's because Dunham pumps have no fine tolerance parts—*need no close clearance adjustments to maintain full capacity.* One simple impeller is the only principal moving element.

Dunham gives you a pump "package" too. No extras to buy! All standard units have controls mounted and wired for immediate use. Duplex Pumps have mechanical alternator as standard equipment.

Low level inlet connections simplify installation. No vacuum on stuffing boxes. All important parts readily accessible outside of tank.

All standard pumps are rated in accordance with A.S.H.V.E. Vacuum Heating Pump Code. For new bulletin just off press, write C. A. Dunham Company, Dept. HV-9, 400 West Madison Street, Chicago 6, Illinois.

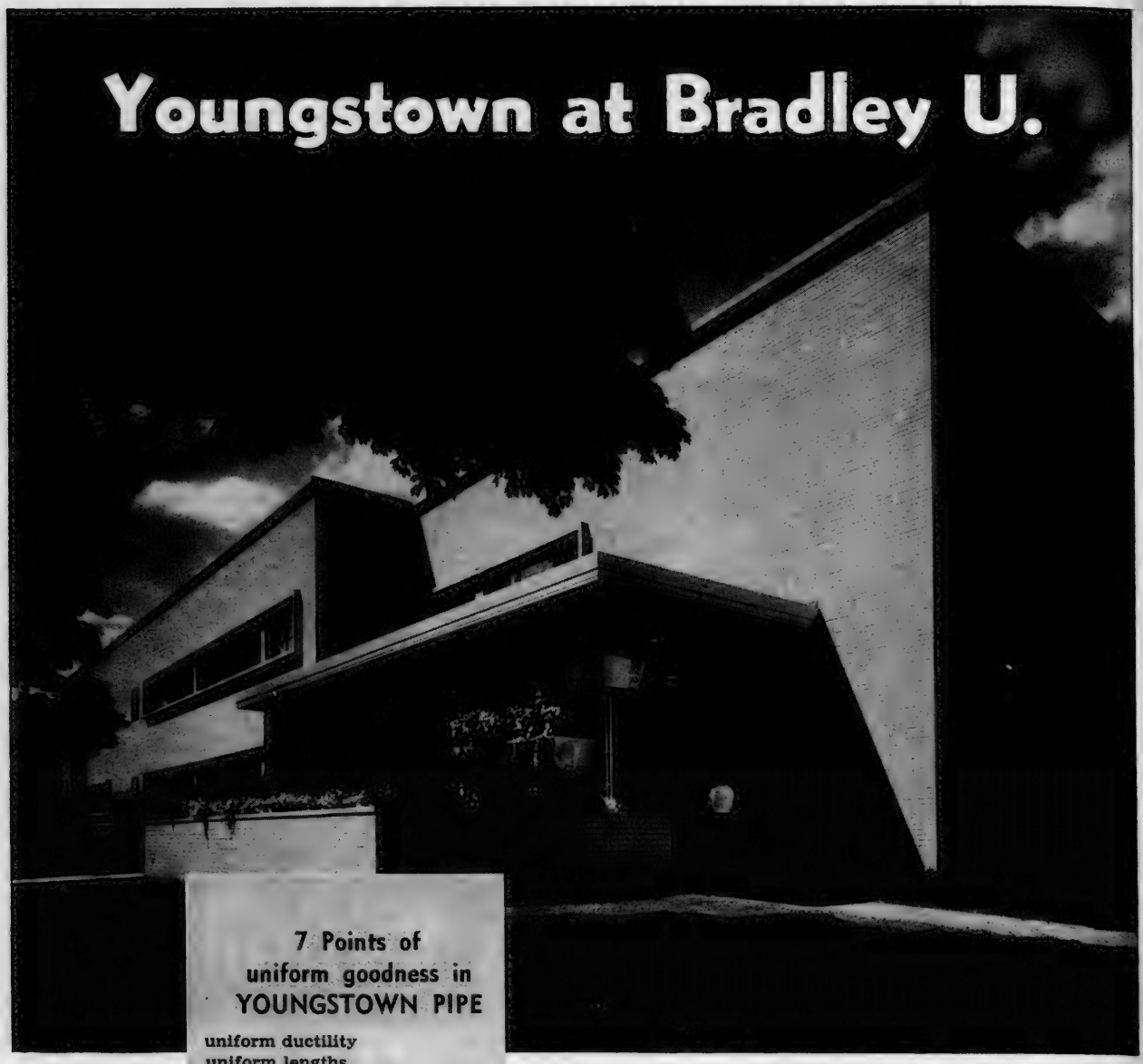
DUNHAM

RADIATION • CONTROLS
UNIT HEATERS • PUMPS • SPECIALTIES

HEATING & COOLING EQUIPMENT

QUALITY FIRST FOR FIFTY-ONE YEARS • C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

Youngstown at Bradley U.



7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

Bradley University Library, Peoria, Illinois, Gregg & Briggs, architects. General contractors —V. Jobst & Sons, of Peoria.

HAVING PROBLEMS?

For information and service, get in touch with the local distributor of Youngstown Steel Pipe—or phone our nearest District Sales Office.

Youngstown

QUALITY · YOUNGSTOWN · SERVICE

● This new library at Bradley University is another modern building for which the architects specified Youngstown Pipe.

Made of finest steel, its quality closely controlled by one producer from ore mine right through to the final threading operation, Youngstown Pipe will insure adequate protection to the water supply for years to come.

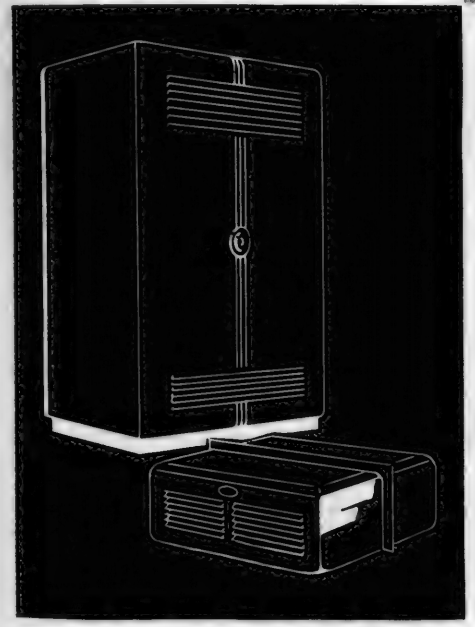
THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

COPELAND WELDED HERMETICS

bring cool-running, 2-cylinder smoothness to package air conditioning

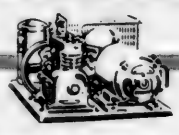


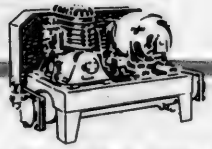
You're looking at a cutaway view of the welded motor-compressor that can give your refrigeration and air conditioning products the competitive edge you need.

This potent Copeland package is engineering at its best. Twin cylinders bring whisper-quiet smoothness. Heavy-duty, high power factor motor insures positive performance and long-range economy. Use of F-12 in these motor-compressors can result in as much as 75 F. lower temperatures in windings, crankcase, oil and discharge side. You'll appreciate their high capacities.

We could go on, point by point, and prove construction superiority. Better yet, we want you to test the Copeland welded motor-compressor in your own equipment under your own conditions.

Write, wire or phone for details about the "try it yourself" test.

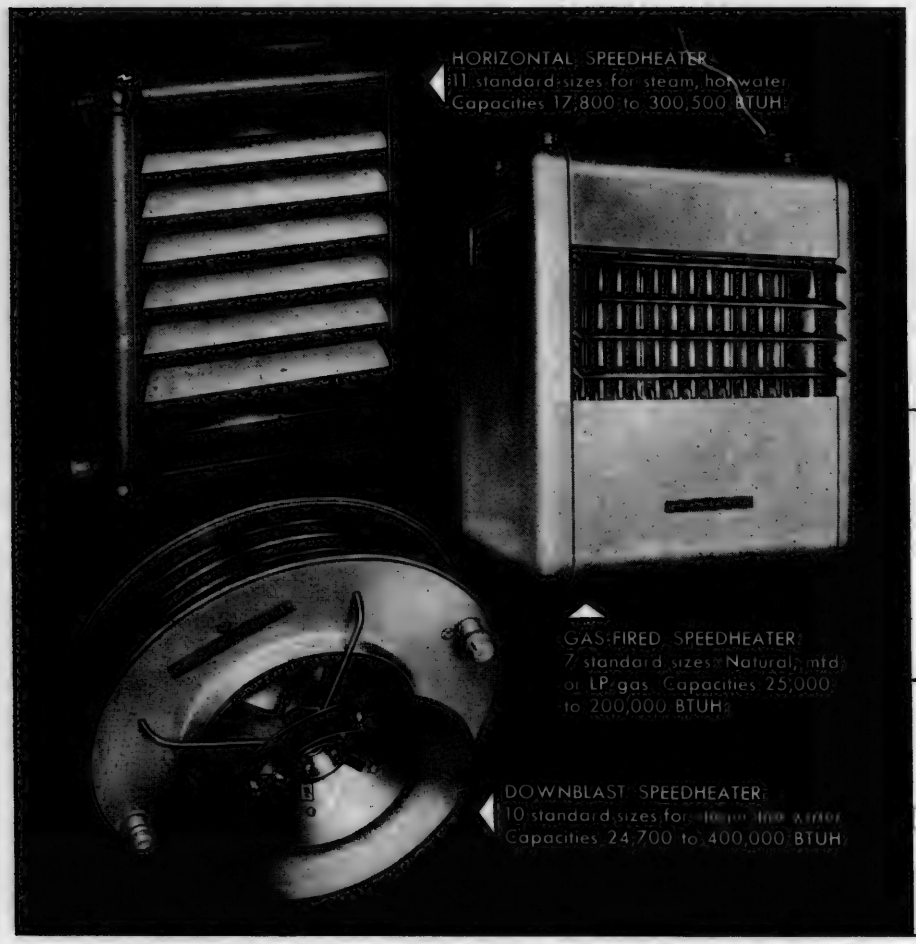




Copeland
DEPENDABLE *Electric* REFRIGERATION

REFRIGERATION UNITS (OPEN-TYPE AND COPELAMETIC) WATER COOLERS

COPELAND REFRIGERATION CORPORATION SIDNEY, OHIO


HORIZONTAL SPEEDHEATER
11 standard sizes for steam, hot water
Capacities 17,800 to 300,500 BTUH
GAS-FIRED SPEEDHEATER
7 standard sizes. Natural, mfd. or LP-gas. Capacities 25,000 to 200,000 BTUH
DOWNBLAST SPEEDHEATER
10 standard sizes for steam and water
Capacities 24,700 to 400,000 BTUH

CHECK THESE WESTINGHOUSE HORIZONTAL SPEEDHEATER SPECIALS!

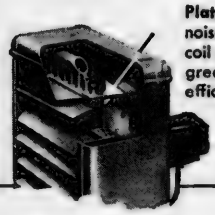
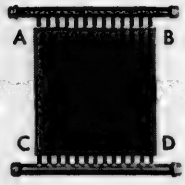


Plate fins cut noise, minimize coil clogging for greater efficiency.

Pliable steel hangers (no extra cost) simplify installation.



Four connection combinations (A-C, B-D, A-D, B-C) allow tight-spot installation.

The traditional value in unit heaters—

Westinghouse Speedheaters®

for instant heat... quiet heat... low-cost heat

Built for strength, built for style, built to install easily and satisfy for years.

For today's outstanding heating value, look to a pioneer name in unit heaters—look to Westinghouse Speedheaters! Check, before you specify, all the features that add up to traditional Speedheater superiority:

(1) instant heat—generated at the flip of a switch, and all of it effective heat because the Speedheater one-row, plate-fin heating element assures most efficient heat flow;

(2) quiet heat—the Speedheater, always known for silent operation, is quieter than ever! Aluminum plate fins, mechanically bonded, cut noise . . . rugged, welded construction eliminates rattles . . . powerful die-formed fans send heat where it's needed, do it *quietly;*

(3) low-cost heat—heat that saves dollars on fuel (up to 25% savings in present installations over old-style systems), more dollars in pure-and-simple efficiency in heating spots or large zones, in supplementing central systems in any required pattern.

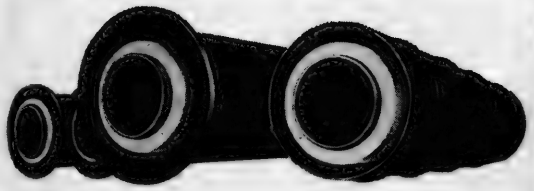
Check other Speedheater values, too: the pliable steel hanger straps and flexible connection combinations (see cuts) that simplify Horizontal model installation . . . the multiple-cone diffusers on Downblast model that give positive heat control, especially desirable for buildings with high ceilings . . . the all-purpose AGA-approved Gas-Fired model that eliminates the need for central system heating. For full information call your Westinghouse-Sturtevant heating specialist now. Or write: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80421

EBKO PIPING SYSTEMS



CAST IRON STEEL

EBKO prefabricated insulated piping systems feature the most advanced design with positive security, outstanding economy, and unsurpassed quality for underground and overhead distribution of steam, condensate return, hot and chilled water.

EBKO is—

- Durable
- Fire Proof
- Guaranteed
- Submersible
- Rugged
- Maintenance-Free
- Easily installed

Write today for additional information on EBKO Piping Systems.

•

E. B. KAISER CO.

Since 1890

2114 West Lake Avenue

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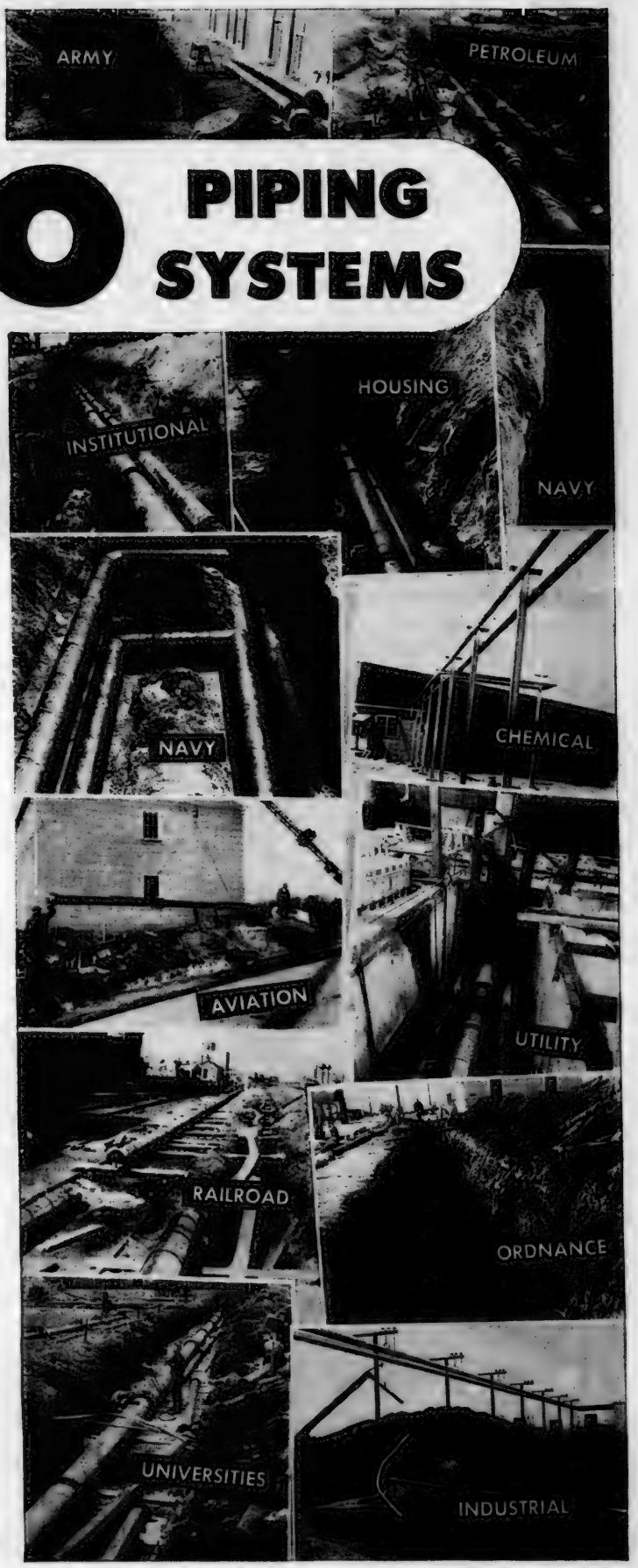
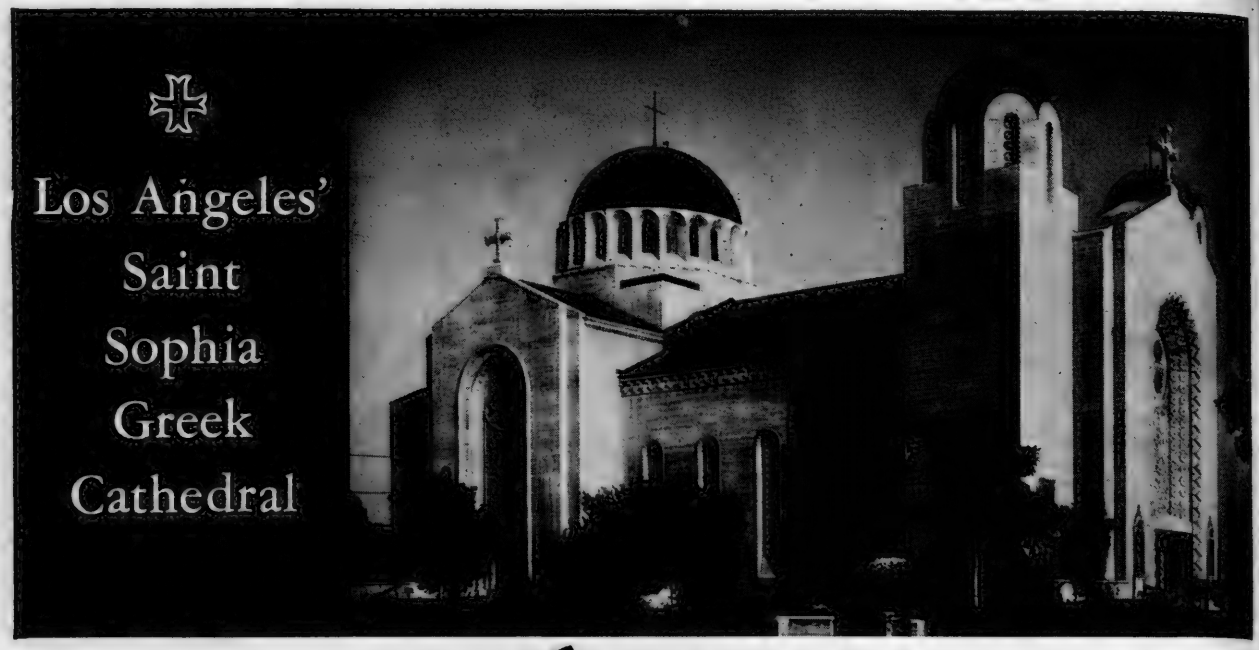
Representatives in Principal Cities





installs heavy-duty *Acme* evaporative condenser

Of outstanding architectural beauty and exquisite interior is the new Saint Sophia Greek Cathedral in Los Angeles, recently displayed in color by Life Magazine (November 3, 1952 issue).

The entire edifice with its elaborate bas-relief arches and smooth contrasting walls supporting the central dome and two flanking domes is constructed of concrete and steel, truly "built for the ages" as was the intention of Charles P. Skouras, President of National Theaters, Inc. when he sponsored this cathedral for the Greek Orthodox community.

Completely air conditioned, the Acme Evaporative Condenser was selected as a unit that would stand up under long usage. Certain built-in features of excellence influenced Mr. J. W. Bantau, Chief Engineer of National Theatres, Inc. in his selection of a heavy duty Acme Evaporative Condenser.

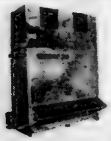
- √ Entire unit hot dip galvanized after fabrication.
- √ Heavy #11 gauge end panels and bottom panels. #14 gauge side panels.
- √ External self aligning ball bearings, vented.
- √ Large cadmium plated shaft (2½" O.D. in this unit.)
- √ All prime surface copper coil.
- √ Vertical flange mounted pump with stainless steel shaft bronze bushed.

ACME

ACME INDUSTRIES, INC.

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

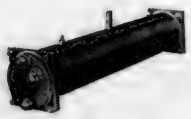
JACKSON, MICHIGAN



Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers

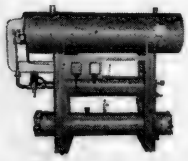
Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators

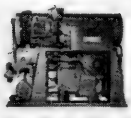


Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils



Packaged Liquid Chillers to 225 tons

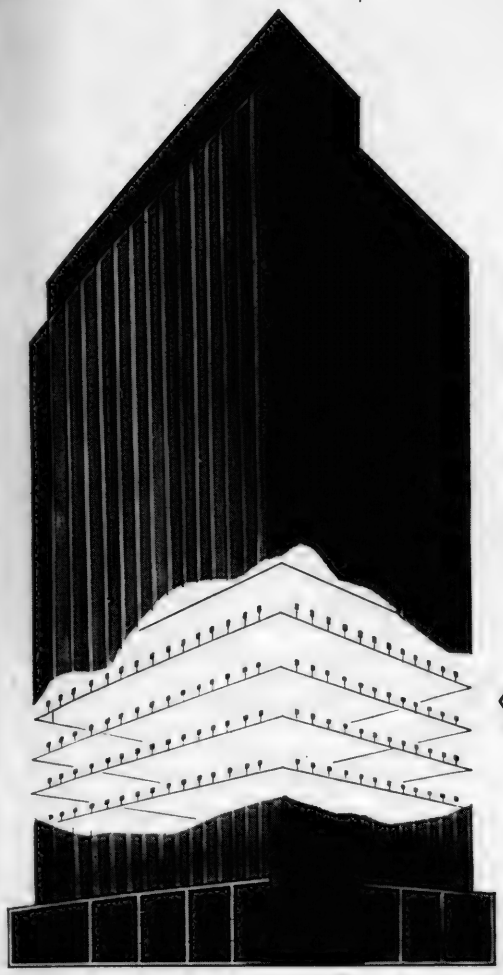


Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers

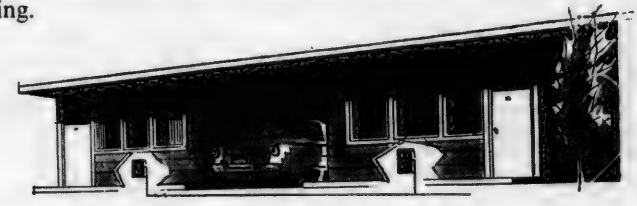
Remote Room Conditioner

Continuously serving the air conditioning and refrigeration industry since 1919



Modulated Heat with Thermostat in Every Room

Every room in a building is an individual zone, with its own thermostat. Every room is heated with filtered warm air, continuously circulated by a compact, recessed wall unit. Sets a new standard of comfort and heating economy for every type and size of residential, institutional and commercial building.



SelecTemp Highlights

THERMOSTAT IN EACH ROOM. Temperatures can be varied in every room to fit the "activity plan" and personal preference of the occupants.

MODULATED HEAT. Air circulation is continuous. Both temperature and volume of air is automatically modulated, as required to offset heat loss from room.

FILTERED, CIRCULATED AIR. Individual room air circulation prevents transmission of odors or bacteria from other rooms. Air is cleaned by a spun glass filter in each room unit. Filtered outside air can be introduced if desired.

BOILER LOCATION. Does not require centrally located heating plant. Boiler can be placed in any desired location, with proper distribution of heat to every room.

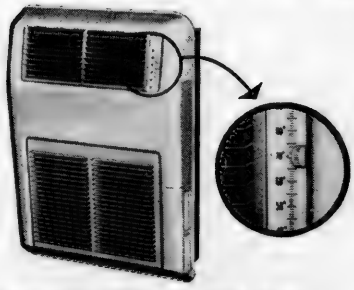
LOW POWER COST. No electricity required to operate circulating fans. Nonelectric thermostats.

LOW INITIAL COST. No other system can be so easily installed in either new or old construction. Small soft copper tubing (¼ inch I.D.) carries steam to individual room heater units. Return lines are ⅛ inch. Tremendous savings in installation costs.

LOW FUEL COST. Temperature easily reduced in unused rooms. Eliminates overheating.

AUTOMATICALLY BALANCED. No special adjustments of dampers, valves or orifices required to balance heating system. Each unit continuously regulates heat needed for each room. Automatically compensates for external heat sources such as fireplace or solar heat, without affecting temperatures of other rooms.

FOR LARGE OR SMALL BUILDINGS



Individual room control with continuous modulated heat

With SelecTemp heating, every room in the building is an *individual zone*, with its own thermostat. Low pressure steam, supplied to recessed wall units through small flexible copper tubing, provides heat and power for the circulating fan. Thermostats are nonelectric and require no wiring.

Exact, constant temperatures

Each room thermostat may be set at any temperature from 40 to 90 degrees. Heat in each room is accurately maintained at the temperature selected. The thermostat detects any change in temperature and regulates both the speed of the circulating fan and the steam supply to exactly meet heating requirements. SelecTemp thus eliminates ordinary on-and-off cycling and "cold 70" stratification. It constantly modulates from 1/20th of capacity to full capacity, supplying just the amount of heat needed. SelecTemp compensates automatically for variations due to changes in outdoor temperature, and in velocity and direction of the wind. It compensates for heat gains from the sun's heat, fireplaces, cooking ovens and body radiation.

Low installation and operating cost

The various parts of the selecTemp system are engineered for rapid economical installation without time wasting special provisions. SelecTemp units are delivered assembled in steel enclosures for mounting in wall stud spaces or wall openings. No electric power required for operation of circulating fans or thermostats—an important saving. Fuel savings result from elimination of wasteful overheating and from lower temperatures in unoccupied rooms. Small steam lines greatly reduce heat transmission losses.

SelecTemp TRADE MARK

PRODUCT OF IRON FIREMAN

Send for full information

Iron Fireman Manufacturing Company
3076 W. 106th St., Cleveland 11, Ohio

Please send literature on Iron Fireman SelecTemp heating.

Name _____

Address _____

City _____ State _____

Copyright 1954 I. F. Mfg. Co.

CONTINENTAL
Automatic Boiler
Manufactured by:
BOILER ENGINEERING & SUPPLY CO., INC.
Phoenixville, Pa.

- Two-pass design — simple and practical. Range 20 to 500 hp; 15 to 200 lbs. W.P.
- Factory tested before shipment. Guaranteed 80% efficiency.
- Spinning gas technique provides maximum radiant heat transfer from flame to water-cooled furnace walls.
- Even heat transfer — uniform flow of hot combustion gases through all return tubes. All tubes do the same amount of work, are subjected to the same temperatures, expand uniformly.
- Free and rapid water circulation keeps all heating surfaces clean; improves transfer of heat to boiler water.
- High CO_2 and low stack temperature — guaranteed not to exceed 125°F. above saturated steam temperature at operating pressure.

Write for Catalogs BE-3, BE-4

Check these points when you select a boiler:

(1) Fiberglas insulation with metal jacket and metallic paint finish.

(2) Lift lugs for convenient handling on job site.

(3) Boiler shell made of flange quality steel. All joints electrically welded. High pressure shells X-rayed to insure flawless construction and long life.

(4) Separator to assure dry steam supply (99%+).

(5) Dual low water cut-out to provide double insurance against dry firing.

(6) Practical front-end construction that provides open flow of combustion gases to stack. No refractories to maintain. Entire burner front hinged, providing easy access to fire tubes.

(7) Burner enclosed in furnace extension.

(8) Burner and its vital parts — such as fuel nozzles, flame scanner and ignition assembly — fully enclosed in steel housing for safe operation.

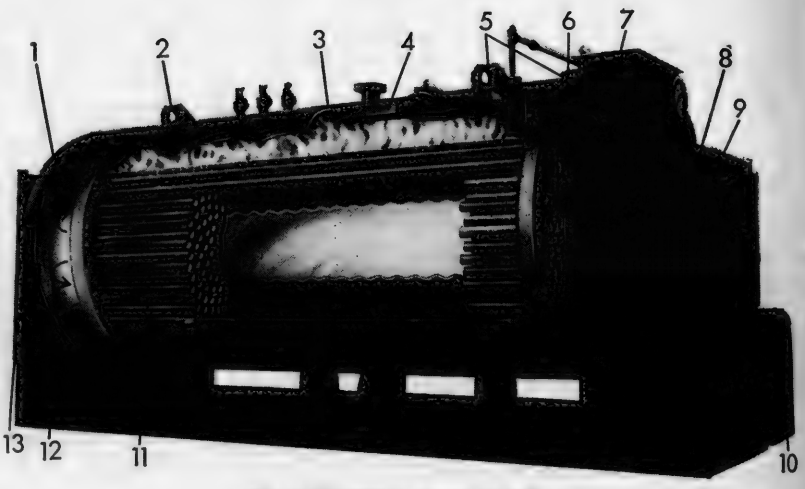
(9) Dual air-flow burner — for oil or gas fuels — precisely fitted to mix fuel and air for high combustion efficiency. Heat transferred directly to water surrounding the furnace.

(10) Air for the burner passes through an inlet silencer to a forced draft fan. Air flow controlled by adjustable dampers.

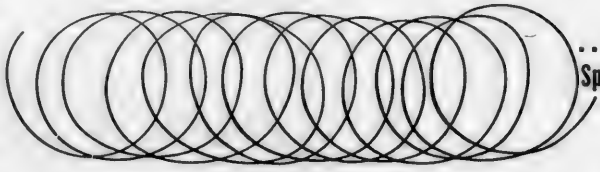
(11) Stationary alloy steel impeller in each return tube to impart spinning motion to hot gases.

(12) Structural steel base distributes weight evenly on boiler room floor. No special foundation required.

(13) Hinged rear door is lined with insulating refractory. Door can be opened in a few minutes — affording access to furnace and all return tubes. No need to remove and replace refractory baffles or brick work. Note sturdy hinge construction which insures positive seating of door.

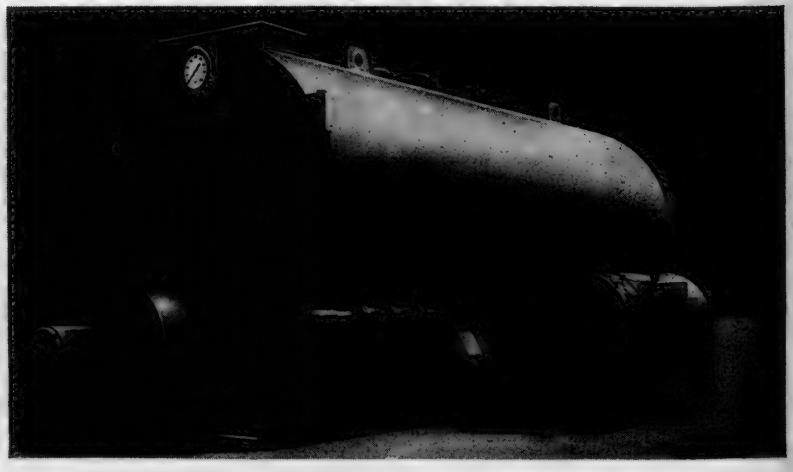


The CONTINENTAL Automatic Boiler



. . . the boiler with the Spinning Gas Technique

Sizes 20 to 500 hp. Pressures 15 to 200 lbs. W.P. Oil, Gas or Combination Fired.



ANOTHER

AGITAIR

PATENTS APPLIED FOR

for BETTER AIR

it's ADJUSTABLE

AIR DEVICES INC. 185 MADISON AVE., NEW YORK 16, N. Y.

NEW OFFICE BUILDING FOR SPRINGMAID.
Architects and Engineers: Robert & Company Associates, Atlanta, Ga.
General Contractors: George A. Fuller Co., New York, N.Y.
Heating Contractors: Standard Engineering Co., Inc., Washington, D.C.

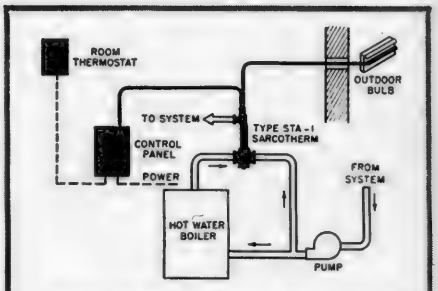
SARCOTHERM *Controls Radiant Heating System in Springmaid's Unique Home Office*

UPSIDE-DOWN WINDOWS, "floating" ceilings, and radiant heated walls tell the story of Springs Cotton Mills' remarkable new building in Fort Mill, S. C.

Sarcotherm weather modulated controls were specified for the building's unusual heating system which operates through radiant panels installed in the walls. The system is divided into seven zones, each of which is regulated by a Sarcotherm Indoor-Outdoor control. Thus each zone is assured comfort regardless of location and outside temperature conditions.

Sarcotherm provides a simple, low-cost way of achieving accurate, sensitive control of radiant and hot water heating systems. Coupled to these distinct advantages is Sarcotherm's extensive engineering service which can help you design and install the most efficient and trouble-free system possible.

A Sarcotherm heating engineer will be happy to talk over your next project with you. For complete details on Sarcotherm weather modulated controls contact your nearest Sarcotherm representative, or write direct to Sarcotherm Controls, Inc., Empire State Building, N. Y. 1, N. Y.



Typical of the Springmaid installation is this hookup. Proportioning type mixing valve continuously modulates water temperatures.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In a Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings and Wiring Diagrams—not just general drawings but complete, tailor-made Sarcotherm drawings and diagrams for each individual job.

On-the-Job Help—your contractor gets Sarcotherm's full cooperation and technical assistance backed by many years of specialized experience.

SARCOTHERM CONTROLS, Inc.

An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for Hot Water, Radiant and Steam Heating Systems

ALCOA SAVES WITH DOREX AIR RECOVERY

● For its new building in Pittsburgh, Aluminum Company of America uses an air conditioning system that is only about one-half the size of conventional ventilating systems. Dorex Air Recovery plays an important part in this saving.

Dorex Air Recovery is a simple method for "reconditioning" used air—making it completely odor-free and fresh for re-use. This sharply reduces the amount of outside air that has to be taken into the system and, as Alcoa knows, reduces the size and costs of heating and cooling equipment; and offers continuing savings in operating costs.

In fact, averages, drawn from more than twenty years' experience with over 10,000 Dorex installations, show that every $100 invested in Dorex Air Recovery should return about a $400 saving in original ventilating equipment...and every $1 spent for Dorex maintenance should save some $4 in operating costs.

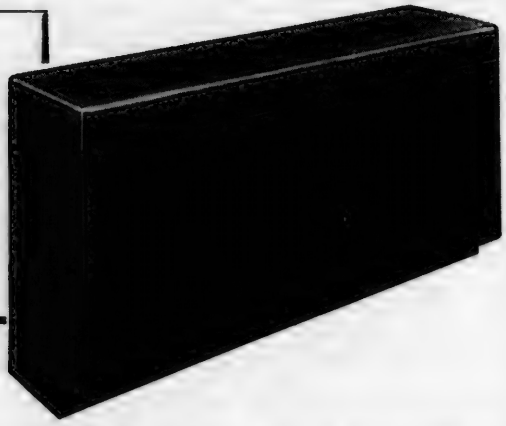
Find out more about Dorex Air Recovery—what it has done for others, what it can do for you. A note on your letterhead will bring full information promptly. Connor Engineering Corporation, Danbury, Connecticut.

CONNOR ENGINEERING CORPORATION

dorex® air recovery

Simple, efficient, easy to install...

The REMOTAIRE
by
AMERICAN-Standard



- **Year 'round heating and cooling**
- **Central plant, multi-room installation**
- **Individual room temperature control**
- **Filters and circulates the air**
- **Single piping circuit**

Remotaire installations are simple and direct. The same piping circuit carries chilled water for summer cooling, hot water for winter heating. There is no bulky ductwork. Water is conditioned in a central plant, yet temperatures can be controlled individually in each room where a unit has been installed.

Remotaire units have reversible coils for right or left hand connections. And each part of the unit is easy to get at.

To meet all types of installation requirements Remotaire units are available in 200, 400, and 600 cfm capacities.

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Fig. 1. Cross section of a piped hospital shows station outlets at all points of use along corridor walls.

Oxygen Piping Systems for Hospitals

Basic information regarding the design and installation of central type oxygen systems for hospitals is made possible through the cooperation of engineers of Linde Air Products Company, a division of Union Carbide and Carbon Company.

LESS than twenty years ago, all oxygen administered to patients in the nation's hospitals was brought to the bedside in individual cylinders. Today the use of oxygen has increased tremendously and the demand for it has become so great, that it is being piped through hospitals much in the same manner of water. Almost all new hospitals are designed to include an oxygen piping system, and these systems are also being installed in existing hospitals. Engineers and contractors who want hospital work must become familiar with the requirements of designing and installing such systems.

Basically, an oxygen piping system consists of a central supply—either a cylinder manifold located within the hospital or a bulk supply unit on the hospital grounds—from which oxygen flows through a system of pipe lines to points in the hospital where it is used, as in Fig. 1. Both the nature of the gas being piped and the fact that a hospital houses many helpless or semi-helpless people demand that a hospital oxygen piping system be designed and installed to provide the highest degree of safety.

Because of their interest in providing hospital patients with oxygen safely, efficiently, and economically, oxygen suppliers have studied all the aspects of designing, installing, and testing piping systems. Over the years they have been called on many times for advice on problems involved in piping a hospital for oxygen and have often been asked to supervise the installation of piping systems. Oxygen suppliers are only too glad to share the knowledge and experience they have acquired in the field. Therefore, before work is started on the piping system design, be sure you consult the hospital's oxygen supplier. Much valuable advice can be obtained and difficulties avoided.

DESIGN

The first step in designing a piping system is to discuss with hospital authorities and the oxygen supplier, the areas to be included in the system. In most cases the best plan for the hospital is a system that gives complete coverage. This means that it will include all places where oxygen is used frequently: Premature and suspect nurseries, recovery room, emergency room, delivery rooms, and areas for special treatment, as well as surgical and medical floors. The complex conditions under which oxygen is used in operating rooms, makes it necessary to give special study to supplying these rooms from the main piping system. If only a partial oxygen piping system is planned, the initial piping network should be flexible enough to be extended to other points in the hospital with a minimum amount of expense and labor at a later date.

After the areas to be piped have been determined, the

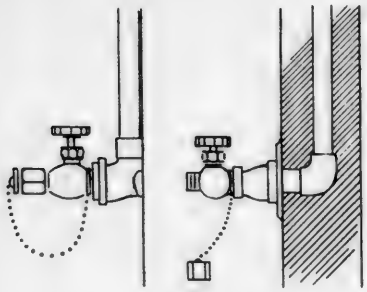


Fig. 2. Piping to station outlets can be run along the face of the wall or within the wall space.

next step is to make a careful inspection to determine the safest, most practical locations for outlets, the best route for the piping, the length of pipe needed, and appropriate positions for section shut-off valves or other line control equipment.

Station Outlets

Each station outlet is equipped with a valve to which a flow-regulating device is attached when oxygen is administered. There should be at least one outlet in each private and semi-private room, and a minimum of one outlet for each three beds in larger wards. Premature nurseries should have one outlet for each incubator; suspect and regular nurseries should also have outlets, the number depending on the size and general set-up of the nursery. In the recovery room, there should be one outlet for each bed. There should be an outlet in each labor and emergency room and two in each delivery room. The number of outlets in special treatment areas should equal the number of patients that can be treated at one time. Hospital authorities, with the advice of the oxygen supplier, will decide on the type of station outlets to be installed. There are a number available from which the hospital can choose the kind most suited to its particular needs. Sometimes it is desirable to have one type of outlet for general use and another for special locations. In most instances, station outlets should be installed five feet from floor level. Piping to station outlets is illustrated in Figs. 2 and 3.

Route of the Piping

To arrive at the best possible piping arrangement, make a study of the hospital and prepare a pipe layout drawing. Secure a dimensional plant map or building plan drawings. If neither of these is available, make a diagram from measurements taken when the building is inspected. On this map or diagram, indicate the position of the planned outlets. Then draw the most direct route, permitted by conditions within the building, that the pipe can follow from the supply unit to the outlets. Cylinder manifolds are usually located within the hospital conveniently near the receiving platform. Bulk supply units are outside the hospital on a site mutually agreed upon by the oxygen supplier and the hospital authorities. It is usually best to arrange the pipe symmetrically so the system can be sectionalized in a uniform pattern to simplify construction and maintenance. Piping should be located so that it will not be exposed to excessive heat or will not be subject to mechanical injury. In addition, oxygen piping and equipment should not be exposed to dripping oil and grease.

Main supply lines from bulk units located outside the hospital building should be run underground, three feet below ground surface where possible. The main supply line in a hospital building is usually run at the basement ceiling level. Risers leading to various floors can be installed in existing piping shafts, which should be vented to the outside. Branch lines leading to rooms, wards, or wings can be run along corridor walls or above ceilings over corridors. Drops from these branch lines can be run within or on the face of the wall to the service outlet. To avoid overextensive branch systems, use extra risers where necessary.

Section Shut-Off Valves

Indicate on the piping layout the locations of section shut-off valves. Section shut-off valves should be provided for each riser near the point where it takes off from the main line. At least one valve controlling each floor should also be provided; individual floors should be further sectionalized if the number of outlets and the length of pipe makes this advisable. If the operating rooms are to be supplied from the piping system, there should be a section shut-off valve outside each operating room and there should be a separate riser for the operating rooms only. This riser should *not* be equipped with a section shut-off valve. The entire system should be arranged so that shutting off the supply of oxygen to any one section will not affect the rest of the system.

Signal Systems

There should be a signal system in the hospital that shows when and if the oxygen supply steam has changed over from the primary supply to the reserve supply. This signal calls attention to the need for replacing cylinders on the manifold or refilling the bulk supply units. It is usually installed in the office of the person who is responsible for the operation of the manifold or bulk supply unit. To be sure that the signal will always be seen, an auxiliary signal light should be located at the telephone switchboard. For extra protection, a second alarm to indicate excessive drop in pipe line pressure is recommended.

Size of Pipe

In practically all hospitals, oxygen requirements are uniform so that the size of the pipe can be determined from the number of outlets necessary. In general 1½-inch main lines, ¾-inch risers, and ½-inch branch lines and

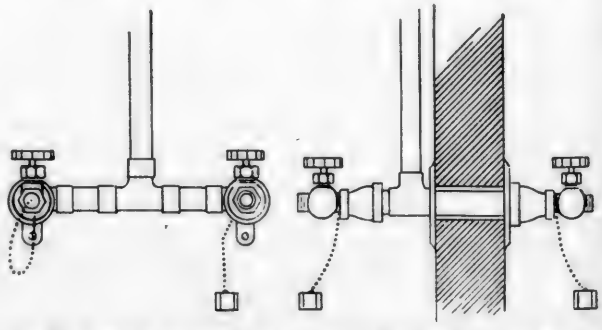


Fig. 3. A single station drop can supply two outlets in the same room or two outlets in adjoining rooms.

station drops are adequate for systems having up to 300 outlets. For larger installations the size of the main line should be increased in proportion to the number of outlets. The same size risers, branch lines, and station drops recommended for 300-outlet installations should be adequate for these larger systems if an adequate number of risers are employed. Tubing smaller than 3/8-inch is not recommended for station drops.

MATERIALS

Because any unexpected interruption in oxygen supply can be harmful to patients and because of economic considerations, a hospital oxygen piping system must be as well-constructed as possible. All materials and workmanship should meet rigid specifications. Only new materials of the best grade and quality should be used and workmanship must be first-class in every respect.

Copper Tube

For hospital oxygen piping systems, type *K* or *B* seamless copper tube is recommended, preferably hard temper for exposed locations and soft temper for concealed locations. It can be installed clean and completely free of the rust and scale that is usually present on welded steel piping. Since it is relatively easy to bend and fit, seamless copper tube is especially easy to install in existing buildings. It can be snaked within wall spaces or above ceilings in concealed construction. If shaped properly, it makes a neat appearance where it must be exposed. The tube should be assembled with fittings made especially for solder-type connections. Detailed specifications on the installation of the piping are given later.

Line Equipment

No single design of shut-off valve, station outlet, wall plate assembly, or valve box is suitable for all hospitals. There are general requirements that each piece of equipment must meet, but the specific design chosen depends on the particular needs of the individual hospital. The oxygen supplier will be glad to assist in choosing the equipment best suited for each hospital.

Section Shut-off Valves

Only brass or bronze shut-off valves, designed for oxygen service, should be used. They must be able to withstand a cold, non-shock gas working-pressure of at least 200 psi. Since the temperature required to make a silver-solder joint is often high enough to warp the valve body or damage the seat material, it is recommended that shut-off valves be fitted with pipe thread to socket type solder joint tubing adaptor assemblies. This will provide enough separation of the solder joint from the valve body to avoid heat damage to the valve.

Station Outlets

Each service outlet must be equipped with a non-interchangeable shut-off valve. Either quick-coupler or manually operated valves may be used. Manually operated valves must have a male 9/16 inch—18-thread outlet. To protect the threaded outlet when it is not in use, it should be provided with a dust cap and chain or installed in a recessed valve box equipped with a door. When the station outlet is equipped with a female member of a quick-coupler, it should have an automatic valve that will shut off the flow of oxygen if the quick-coupler is removed from the line for repair.

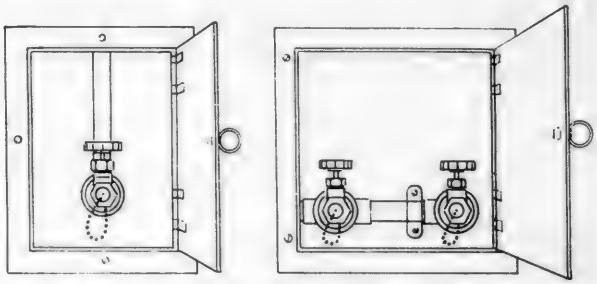


Fig. 4. Either single or double outlets can be installed in wall boxes.

The type of station shut-off valve installed is a matter of choice. Manually operated valves require very little maintenance and provide a positive shut-off method of attaching apparatus to station outlets. In locations, such as nurseries, recovery rooms, and operating rooms, where equipment is usually left permanently attached to station outlets, manually operated valves may be found to be more practical.

Station Outlet and Shut-off Valve Boxes

Station outlet boxes, Fig. 4, are expensive, difficult to keep clean, and, unfortunately, are often used as catch-alls for such miscellaneous articles as cleaning tissue, paper cups, and candy wrappers. Despite this, many hospitals want them installed for the sake of appearance. If they are used, station outlet boxes should have sloping bottoms to discourage their use as storage receptacles. Station valve boxes may vary in shape and size. In general, a single-outlet wall box should be 7 inches wide and 7½ inches high. The depth depends on the equipment to be installed in the box and the thickness of the wall partition. The door can open downward or to one side, but in either case should open flat against the wall. For multiple-outlet boxes, add about 4 inches to the width of the box for each additional outlet. If vacuum outlets are included, the boxes may have to be wider. Frequently, a local sheet-metal shop can make valve boxes from 16 or 18 gage sheet to the desired specifications. There are also standard valve cabinets or access panels available that will fit most circumstances and which are no more expensive than cabinets made for a specific job.

Section shut-off valves located in busy corridors must be enclosed in locked valve boxes with breakable windows. These boxes also vary with the type of valve to be housed, the thickness of the wall partition, and the general interior scheme of the hospital. Consequently, it is usually more satisfactory to have them made to order. This type of box can also be obtained from the same companies that manufacture station outlet boxes.

Pressure Gages

Complete ready made signal systems are available to indicate change-over to reserve oxygen supply or to show

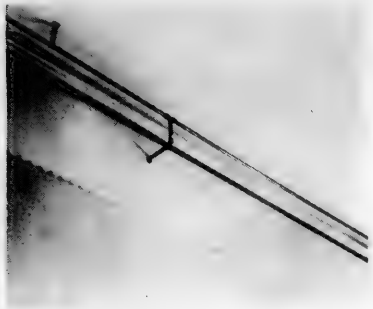


Fig. 5. Exposed piping can be run along corridor walls.

a drop in pipe line pressure. All pressure gages, including those used temporarily for testing, must be manufactured expressly for oxygen service.

INSTALLATION

Washing

Before erection, all tube, valves, and fittings—except those supplied by the manufacturer especially washed for oxygen service—must be thoroughly cleaned of grease, oil, and other combustible materials. If oil and grease are not removed, they may ignite violently in the presence of oxygen under pressure.

Tanks for washing tube can be made by splitting larger diameter pipe, second hand domestic hot water tanks, or other cylindrical vessels and welding them together end-to-end. A separate trough for rinsing is also desirable. One pound of sodium carbonate or trisodium phosphate to three gallons of water will make an effective washing solution. (Never use carbon tetrachloride for cleaning pipe. It is an effective cleaning agent, but its vapor is asphyxiating and toxic.) The solution can be kept hot with scrap wood fires or steam. The pipe should be left in the washing solution until all signs of dirt on its surface can be rinsed off easily. It may be necessary to scrub the pipe to remove stubborn spots of dirt. When the solution is fairly fresh and hot, washing for 15 minutes is usually adequate. All traces of dirt and cleaning solution should be removed from the piping by rinsing it in a continuous flow of well-circulated supply of fresh, warm water.

After all fittings and tubing have been cleaned, they must be handled and stored with care to prevent contamination. The tools used in cutting and reaming must also be free of oil and grease. Any cleaned piping or fittings that are contaminated must be rewashed. If these procedures are not followed, it will be necessary to clean the pipe line after erection, which is time-consuming and expensive.

Assembling

Tube should be cut accurately to measurements taken at the place it is to be installed and worked into place without springing or forcing. All joints in the tube, except those at valves or in equipment requiring screw connections, should be made with solder type copper fittings. Turns or offsets in the tube of a radius less than five times the outside diameter of the pipe, should be made by solder type fittings, or by tube shaped with bending tools. Bends should be free of any appreciable flattening, buckling, or thinning of the tube wall at any point. Solder type fittings should also be used for branch connections and reducing joints, or for closing off of tube ends.

All brazed connections should be made with silver solder or similar high melting point (at least 1000F) brazing material. Handy and Harmon Company's "Handy" brazing flux is recommended. However, any water-mixed silver-brazing flux equivalent in fluxing action and ease of removal from the assembly after brazing can be used. Never use fluxes containing alcohol or other materials that might be combustible in oxygen. Flux should be applied carefully to avoid leaving any excess inside the completed joint. Suitable adaptors should be used for installing valves and other equipment provided with threaded connections. Screw joints used in attaching valves or other permanently connected equipment should be made by tinning the male thread with soft solder. Except for these stipulations, tube and fittings should be joined according to the manufacturers' recommendations. After assembly, the outside of the joint should be scrubbed to remove any excess flux.

Locations and Supports

All tube in buildings should be supported at least every ten feet by means of clamps or hangers. Overhead piping, Fig. 5, can usually be securely supported from walls and ceilings. All exposed tube should be identified so that it can be easily distinguished from other piping and this can be done by painting it a distinctive color such as olive green, or by applying color bands or other suitable markings. Exposed tube in patient areas, Fig. 6 and 7, and also corridors may be painted to blend with the color of the walls, but it must be labelled in at least one place in each room and floor it passes through. When concealed piping is installed in existing buildings, Fig. 8, plaster must be grooved out so that piping can be run within the wall space.

Underground tube should be installed in trenches deep enough to avoid damage from pressure and vibrations from surface traffic. The bottom of the ditch should be carefully graded to furnish a continuous, firm support to the pipe. Casing of larger size pipe can be used under roadways. When underground tube is laid in cinder fill or in soil of acid character, it should be surrounded by a three-inch layer of slaked lime. Tube embedded in

Fig. 6. View of exposed piping in a patient's room.

concrete should be wrapped with tar paper or heavily coated with asphalt to allow freedom of movement.

All valves should be installed in accessible locations and should be independently supported to prevent the forces used in operating them from putting a strain on the tubing or joints. When valve boxes are used, they should be large enough to allow space for operation and maintenance. Each section shut-off valve must be identified with a sign or tag attached to the valve or placed near it. These signs should read about as follows:

DO NOT CLOSE EXCEPT IN EMERGENCY—THIS VALVE CONTROLS OXYGEN SUPPLY TO THE FOLLOWING ROOMS:

TESTING

Blowing Out

After placement of the tube, but before installation of outlet valves, the line should be blown clear with water-pumped compressed air or nitrogen. Oil contaminated air should never be used. If the piping system is extensive, it is generally advisable to manifold several cylinders of the test gas together. A pressure-reducing regulator should always be used to reduce the test gas from cylinder pressure to the 50 psi blowing pressure. Effective blowing out requires a very high rate of flow to ensure that particles of dirt will move along the pipe and discharge from its end. A mere drainage of a pressure-filled section, even if repeated, is not effective. Flow should last long enough to carry the particles to the open end. To conserve the blowing medium, however, short repeated blasts are recommended.

Section Test

After each section of the piping system is completed, including the installation of station outlets, the section should be subjected to a test of 150 psi by means of water-pumped compressed air or nitrogen. Test pressure should be maintained until the tightness of each joint and valve has been checked. Leaks can be detected by painting the joints and valves with a soap solution. The soap solution should be made with a grease-free soap, such as Ivory, and shou'd be applied with a new or clean brush. Any

Fig. 7. Another view of exposed piping in a room.

Fig. 8. When concealed piping is installed in existing buildings, plaster must be grooved out so that tube can be run within the wall space.

leaks found should be repaired and then the section should be retested.

Final Test

A final 24-hour standing pressure test with water-pumped compressed air or nitrogen at 150 psi must be made to check the tightness of the entire system. Any pressure drop beyond what is caused by temperature changes will indicate a leak. It can probably be found by applying soap solution to the joints and valves as was done in the section test. Maintain this final pressure test until the piping system is ready to be put into service. In this way any leaks that occur while general finishing work is going on can be found immediately. This will save the expense of ripping out plaster to get at a leak and replastering and repainting after the leak has been repaired.

Purging

Just before putting the piping system into operation, the test pressure should be released and the line purged with U. S. P. oxygen. First of all open the main shut-off valve at the supply unit and fill the line with oxygen at working pressure. Next open each station outlet valve and let the oxygen blow out until the discharge is pure enough to administer to patients. Be sure that there is ample ventilation to prevent high concentrations of oxygen during purging. When high capacity piping is being purged, oxygen should be discharged through a hose leading to the out-of-doors.

Remember that the planning, design, fabrication, and final installation of safe and efficient piping system is the result of teamwork between hospital administrator, architect, engineer, contractor, and oxygen supplier, each contributing knowledge of his particular field to the overall problem.

Heat Transfer to or from Water by Free Convection

F. W. HUTCHINSON

Professor of Mechanical Engineering, University of California, Berkeley, California

CONSIDERING that the heating of water by free convection (that is, without mechanical agitation) is of such general application and importance, it seems somewhat surprising that the literature of heat transfer provides so little information of direct help in determining the film coefficient on the water side of the heat transfer surface. Even in cases where some flow may occur—as in the typical sidearm water heater—conditions are likely to be close to those corresponding to free convection. In all such cases the rate at which heating occurs will be given by the general equation,

$$q = UA\,(t_h - t_c) = A\,(t_h - t_c)/[\,(1/h_i) + (L/k) + (1/h_o)\,] \quad (1)$$
$$= A(t_h - t_c)/R = A(t_h - t_c)/(r_i + r_w + r_o)$$

where

- q = rate of heat transfer, Btu per hr.
- A = area of transfer surface, sq ft.
- t_h = temperature of the heat source, F.
- t_c = temperature of the heat receiver, F.
- U = overall coefficient of heat transfer, Btu per (hr) (sq ft) (F).
- R = overall thermal resistance, equals the reciprocal of U.
- L = thickness of the transfer surface, ft.
- k = thermal conductivity of the transfer surface, Btu per (hr) (sq ft) (F per ft).
- h_i = inside film coefficient, Btu per (hr) (sq ft) (F).
- h_o = outside film coefficient, Btu per (hr) (sq ft) (F).
- r = thermal resistance of the section of the system identified by the subscript as: inside film, i, transfer wall, w, outside film, o.

All terms in equation (1) are directly known or measurable except the inside and outside film coefficients. The inside film coefficient, h_i, will always be for conditions of forced convection or for phase change (as condensing steam), hence can readily be evaluated.[1] The outside film coefficient, h_o, is the most important term in equation (1), but seemingly the literature does not provide any easy means of evaluating it. Considering that the thermal resistance of the transfer wall, r_w, is likely to be negligibly small and that the thermal resistance of the inside film will usually be less than one-fourth that of the outside film, it is evident that accurate evaluation of h_o is a matter of the greatest importance. Unfortunately, however, the equation which most closely correlates available data on free convection is a complex one and tedious to apply; the intent of this article is to provide the designer with a simple, direct-reading, graphical solution for water which retains the accuracy of the generalized free convection equation, but eliminates the need for determining physical properties or for calculation.

For free convection conditions such as exist in most water heaters or coolers the recommended[2] equation is,

$$h_o\,D_o/k_f = 0.53\left\{[\,(D_o^3\,\rho_f^2\beta g\triangle t)/\mu_f^2]\,(C_p\mu_f/k_f)\right\}^{0.25} \quad (2)$$

where

- D_o = outside diameter of the tube or pipe through which heat is being transferred, inches.
- k = thermal conductivity of water.
- ρ = density of water, lb per cu ft.
- β = coefficient of volumetric expansion of water, cu ft per (cu ft) (F).
- g = acceleration due to gravity, ft per (hr)^2.
- t = temperature difference between transfer surface and water, F.
- μ = absolute viscosity of water, lb per (ft) (hr).
- C_p = specific heat of water.

The values of k, ρ, and μ are all to be taken at the mean temperature of the outside film. The difficulty in calculating h_o from equation (2) is that the five physical properties of *water* (k, c_p, ρ, μ, β,) must be looked up at the *assumed* mean temperature of the outside film.

The graphical solution presented herewith has all physical characteristics built in as a function of temperature, hence all that is needed to determine h_o is a knowledge of heating-to-cooling temperature difference, outside diameter of tube or pipe through which transfer is occurring, and an assumed value of the mean film temperature. Fortunately for the designer substantial error in estimating the film temperature has relatively little effect on the value of h_o.

Example: A coil of ½-inch nominal diameter Type M copper tube (outside diameter of 0.625 inch) is circulating hot water at a mean temperature of 136F to heat a tank of water which is at a temperature of 71F. Determine the film coefficient for free convection from the tube surface to the water in the tank.

Solution 1: By graph. The film temperature will be assumed at the arithmetical average of the two fluid temperatures, hence is (136 + 71)/2 = 104F. Enter the bottom scale of the graph at 104F, rise to the base curve (the solution is shown by the dashed example line on the graph), move horizontally to the right to intersection with the transfer line, rise to intersection (by interpolation) with the line for outside diameter of 0.625 inch, then more horizontally to the right to intersection with the transfer line. From this intersection rise to the upper half of the graph where intersect the radial for a temperature difference of 65F; from this point move horizontally left to the transfer line and then rise to the top scale

[1] A graphical solution of h_o for water appeared in the December, 1944 issue of Heating and Ventilating; a different graphical solution for the same term is available in the reference indicated in footnote 2.

[2] Industrial Heat Transfer, F. W. Hutchinson, The Industrial Press, 1952.

where intersection occurs at a value of the outside film coefficient of slightly more than 150 Btu per (hr) (sq ft) (F).

Solution 2: By calculation. The film temperature (as determined above) is assumed at 104F. From standard references it is found that the values of the physical properties at this temperature are: density of 61.9 lb per cu ft; absolute viscosity of 0.648 centipoises or 1.568 lb per (ft) (hr); thermal conductivity of 0.360 Btu per (hr) (sq ft) (F per ft); specific heat of approximately 1 Btu per (lb) (F). The value of the coefficient of volumetric expansion is $0.115(10)^{-3}$; and acceleration due to gravity is $4.17\ (10)^8$ ft per $(hr)^2$. The temperature difference between the heating and cooling fluids is 136 minus 71 or 65F.

Then substituting into equation (2),

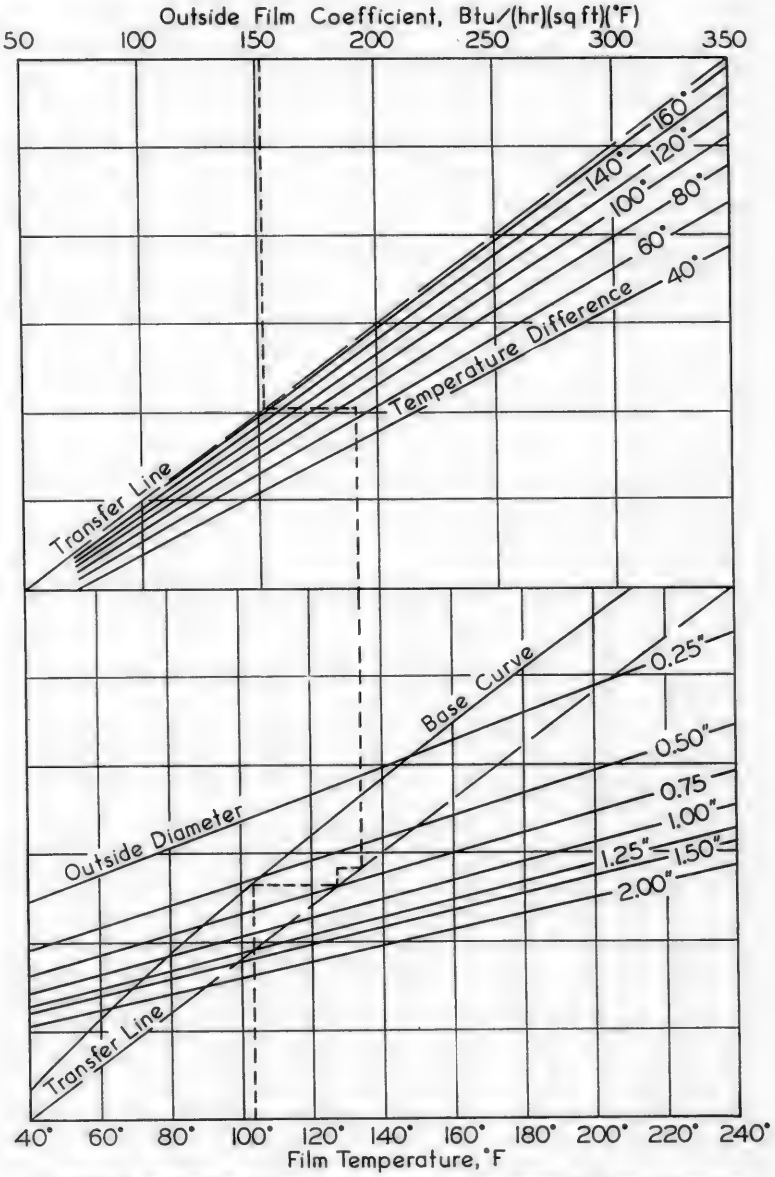
$$[h_o(0.625/12)/0.360] = 0.53\left\{[(0.625/12)^3(61.9)^2(0.115 \times 10^{-3})(4.17 \times 10^8)(65)/(1.568)^2] \times [(1.0)(1.568)/0.360]\right\}^{0.25}$$

$$= 0.53\ [(686000)\ (4.36)\ ]^{0.25} = 0.53\ (41.55) = 22.0$$

The value of the outside film coefficient is therefore

$h_o = [(22.0)\ (0.360)\ ]/(0.625/12) = 152$ Btu per (hr) (sq ft) (F)

which agrees with the value obtained, without calculation, from the graphical solution.



Graphical evaluation of heat transfer to or from water by free convection.

Summary: The determination of the film coefficient for heat transfer by free convection is a tedious procedure. The present article presents a graphical representation of the basic free convection equation for water, which permits evaluation of the film coefficient without need for determining the values of the physical characteristics and without need for calculation. The results obtainable from the graphical solution are equivalent, in accuracy, to those obtained by use of the equation.

Limitations of the Safety Loop

T. W. REYNOLDS

A discussion of the evolution of the safety loop, and what it can or cannot be expected to do. Several types of boiler installations are described

SINCE so many mistakes are made regarding the design and installation of the boiler safety loop, the entire subject should be reviewed to provide a better understanding as to when the safety loop is needed, where it should be used, and how little protection it offers for the expense and difficulties often encountered. To some, parts of the explanation may seem elementary, but a thorough discussion was considered necessary for a better knowledge of the subject.

From curiosity, I have observed many safety loops in widely separated localities. Many were not needed and some were poorly arranged and sized; many were set so low they gave only partial boiler protection, or none at all; too many were noisy or introduced troubles not previously experienced without them.

The loop in the course of time became over-rated. It does not and cannot do some of the things which many think it should do, and often does not do the things it should do. Pump manufacturers do not like it for it adds to their service troubles. Contractors do not like it because of added labor which is costly. Installers are apt to put it in wrong. It is a source of complaint, and the cause of repeated trips for correction.

From the standpoint of the underwriters of boiler insurance, the loop can do them no harm and sometimes does them some good, but from the standpoint of the contractor and user it can cause them trouble and constitutes a rather expensive form of insurance for the risk involved. The few breaks are relatively minor to the total number of modern boilers insured. However, at the time the loop was originated, there was more need for it than now. Heating systems were crude and manually controlled; long wet returns were buried and poorly so; equipment was not sufficiently elevated; and long returns were often just below or above the boiler water line, while many returns were unduly exposed to mechanical injury or leakage from corrosion.

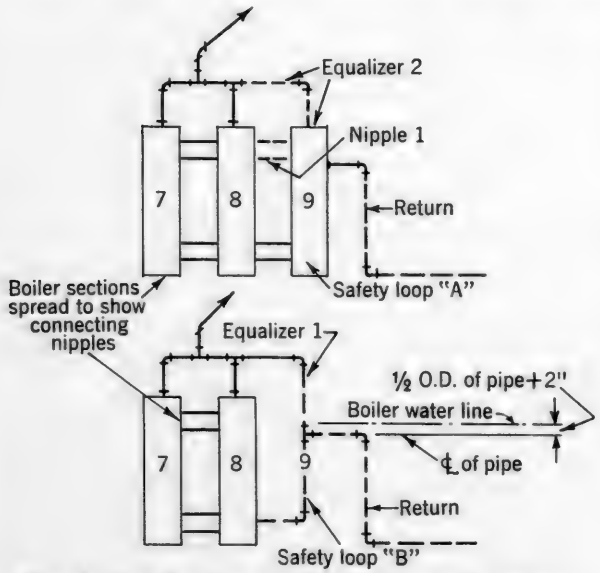


Fig. 1. How the loop, in effect, adds a boiler section.

In Fig. 1, the rear sections 7 and 8 of an eight-section cash iron boiler are shown with sections spread unnaturally for purposes of illustration. If the upper nipple 1 is omitted and equalizer 2 installed, an enlarged safety loop, designated *A* has been created, in effect the same as shown for the normal safety loop *B*. Therefore, the addition of a safety loop is the same in equalizing effect as the adding of a boiler section. If additional steaming effect is also desired, nipple 1 must be put back in place to add section 9, in which case equalizer 2 is no longer a necessity, but can be retained. With such change, the colder water of the return enters the boiler near its water line, although it is preferable that it be mixed in a return header and then enter the bottom of the boiler as in loop *B*. It will be seen that for safety loops *A* and *B*, the pressure on the surface of the water in the boiler sections and pipe 9 are practically uniform, hence that their water levels will be uniform.

Evolution of the Loop

In 1920, the National Boiler and Radiator Manufacturers Association, because of the unsatisfactory operation of check valves, more particularly with boilers in battery, suggested that the returns to heating boilers be connected at their water level as a measure of safety to the boilers. The Hartford Steam Boiler Inspection and Insurance Company conducted, in 1920, a series of experiments at the plant of H. B. Smith Company, Westfield, Mass., as a result of which the loop was endorsed by the insurance company. Hence, the various names for the loop—Hartford, Underwriters and Safety. By whatever name called, to my knowledge, it never became a must requirement or ever reduced any insurance rates.

The safety loop as originated in 1920, Fig. 2, has been subject to modification ever since to avoid troubles that ensued. Pipe sizes for steam equalizer *A* and *B* were then fixed, and still are, as 1½-inch and 4-inch for grate areas of 4, and 4 to 15 sq ft, respectively. However, time has passed so the hand-fired grate areas of that time constitute poor basic data for sizing loops connected to modern automatic fast steaming boilers, with or without grates, and using other fuels. The writer has seen more of our old rules of heating finally made scientifically determinable, but this is one of a very few that remains as formerly.

Originally, the water portion *C* of the equalizer in Fig. 2 was fixed on the basis of the return pipe size, which was usually smaller, but this portion is definitely a part of the equalizer. It is now more or less recognized

that it should not be less in size than the steam portion so as to provide equal area for a dancing water column and that all portions of the equalizer should not be smaller in size than the return size. Whatever size is desirable for the return, is equally as desirable or more so, for the volume of flow in the equalizer.

In the case of the cross connection *D*, no size was fixed, but this should be the same size, especially as the center line of its pipe was fixed at the boiler water line. Such location traps steam in the horizontal pipe with each fluctuation of boiler water level. At times this cross connection would empty, permitting steam to equalize between boilers. At other times, flood and equalization would cease. In any event, no part of the loop or its horizontal return connection at boiler water line should be common to two boilers. Since no two identical boilers have identical operation due to causes hereinafter enumerated, they will have differing evaporation rates or pressures. Therefore, water from one boiler will be forced through the cross connection to flood the boiler under low pressure, a condition that check valves formerly created, and the very thing which the safety loop was designed to avoid. Differences between boiler pressures are sometimes substantial, but even a minute difference of 1/16 lb will raise water 1.7 inches.

The related condition of pounding can occur in the cross connection of Fig. 3 and interchange of boiler water will take place in both Figs. 3 and 4. Some installations are now and then being made as shown and others still exist, hence the reason for reiterating the avoidance of the mistakes that originated in past years. There is always a temptation to simplify and save on pipe by making the loop as common to two boilers as possible. However, boilers should have individual loops as shown in Figs. 5 and 6. Originally, any water hammer in the horizontal connection was set forth as a measure of safety by directing attention to unsafe conditions. However, the noise proved too frequent and annoying and occurred in so many cases where conditions were yet safe that it proved nothing.

The horizontal connection of the return to the loop at

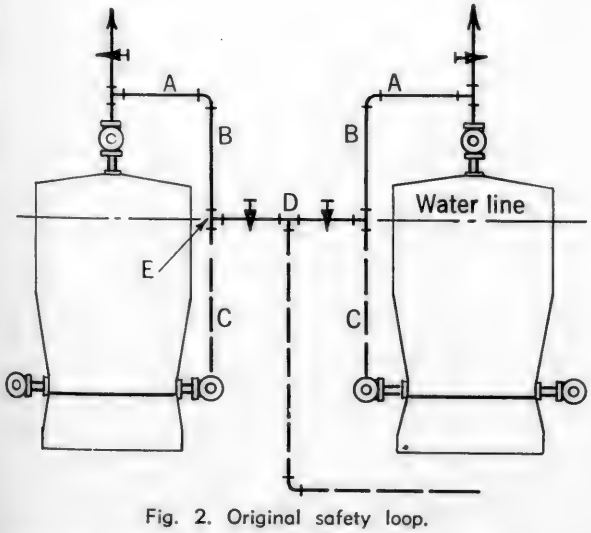


Fig. 2. Original safety loop.

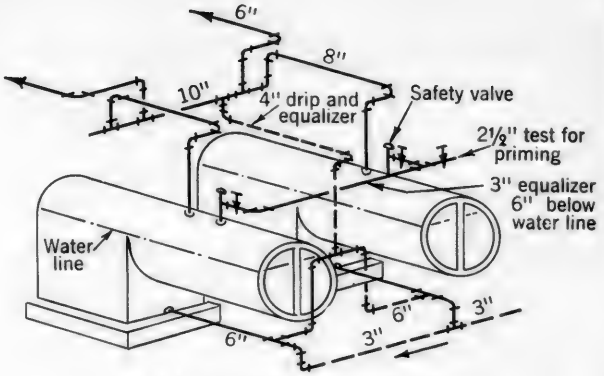


Fig. 3. Safety loop for steel boilers.

or near boiler water line (see *D* of Fig. 7) was often made so long that it not only trapped so much steam with resultant destructive and annoying water hammer, but also took too much backflow from the boiler. So it evolved from a long to a short pipe, then a short nipple, and next to the close nipple. Finally, in some cases, it moved to the wye fitting (see *C* of Fig. 7). Although pounding has not been eliminated in all installations with wye fittings, yet where it does exist, it is not as pronounced as it used to be with a tee fitting. Where a wye fitting is used on other than pumped returns, I know of no difficulties of any kind.

What the Loop Does Not Do

From queries received, there are many persons who believe the safety loop aids in returning condensate to the boiler and also prevents water from backing out of the boiler to flood the heating system, particularly so when a boiler steam valve is closed. It could do this last if the bottom inside of the horizontal connection from the return were precisely at the boiler water line prescribed by the boiler manufacturer, or the higher one sometimes carried in operation. However, as usually installed, it is submerged to avoid related difficulties. Hence it is only partially safe from back flow and, under some conditions or installations, is not even safe enough to protect the boiler. It should also be remembered that water can be evaporated to extensive systems during pick-up load faster than it can be returned. In all fairness, however, the given name of safety loop is not meant to apply to any lowering of water level which still leaves the crown sheet sufficiently covered with water.

A safety loop prevents only that portion of the water from leaving the boiler which is below the bottom inside of pipe or nipple connecting the loop to the return. See *D* of Fig 7. Now some designers fix the distance down from boiler water line to center line of horizontal connection at 6 inches as in Fig. 3. This gives a submergence of 3.8 inches for the top of the largest or 4-inch connection used and 5.1 inches for the smallest or 1½-inch connection, where the rate of flow and need of submergence is least. Furthermore, the boiler can lose 8 inches of water with the 4-inch connection and 6.8 inches with the 1½-inch. This is probably down to unsafe levels with some boilers and with any system where initial condensation is not returned in amount equal to the water evaporated. It should be remembered that most of the water in a boiler is in its top where lowering of the water line first takes place.

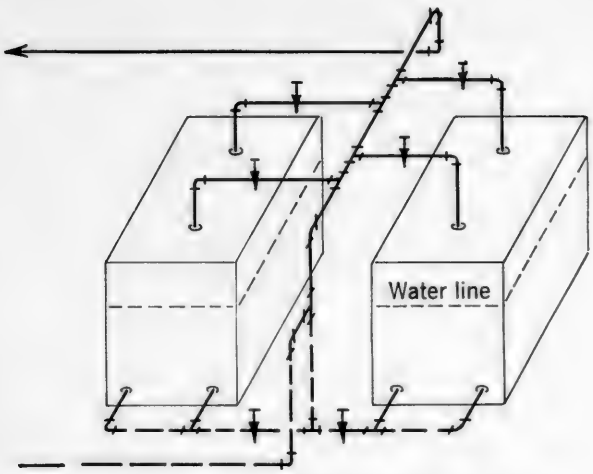


Fig. 4. Safety loop without separate boiler protection.

Boiler Can Still Lose Water

The depth of submergence of top of pipe should be the same regardless of pipe size, hence it is generally now fixed at 2 inches. This means for 1½, 2½ and 4-inch connections, a loss of water to the depth of 3.8, 4.7 and 6.3 inches, respectively. The last depth is still considerable for the 4-inch connection. Another thing that affects water level is that true boiler pressure is seldom communicated to the top of the loop. This can be insured only by a short direct steam equalizer of simple size connected directly to a separate boiler outlet located where the evaporation rate is representative or average. If, however, it is small or long, has too many turns, fittings and burr, drains a steam pipe, or is connected to a steam pipe under a fair load, the communicated pressure will be reduced by frictional resistance in proportion to the load carried and will therefore be less than boiler pressure. Should the pressure drop be only 1/16 lb, the water line will further lower 1.7 inches. In the valley of water fluctuations, the water line will be even lower, even with clean water. Furthermore, I have observed many an installation where the loop was only a token loop because of additional submergence through carelessness or error in measurement.

On the other hand, if a wye fitting is substituted, as shown at *C* in Fig. 7, and the inner inverted apex of the wye submerged 2 inches, particularly when a pump is used, then only 2 inches of water level can be lost from the boiler, provided the loop is subject to true boiler pressure and boiler water maintained clean. Actually, most wye fittings are installed without any submergence and probably need none. Of course the less backflow of water which the safety loop allows, the less the heating system will be flooded.

Steam pressure in the boiler above its water line acts downward upon the water to force the water out through the return inlet until this backflow and condensation from equipment builds up a water column in the vertical returns of sufficient height or weight to exert a static pressure at boiler water line equal to the difference in pressure between that in the boiler and the heating equipment. The pressure in the latter will vary according to location and condensing capacity and action of controls. It may be none at all, or it may be well below atmospheric pressure due to modulation of some blast coil.

The height of water column in the returns will be 2.31 ft for each pound of differential pressure with water at 62F. When, however, water is at a temperature of say 200F, it will be 2.4 ft, but this slight difference can be neglected. With 1 lb pressure in the boiler and 15 inches of vacuum, (7.35 lb below atmospheric pressure) in a blast coil, the height of column would be $(7.35 + 1) \times 2.3 = 19.2$ ft. Hence, in such cases it becomes necessary to install a vacuum breaker, or use an open circuit heating system, or best of all, a vacuum system, so that the differential is reduced to only 1 lb.

However, as long as the volume of water required for the return head is such that it can be withdrawn or withheld from the boiler without seriously lowering the water level within it, the boiler will be safe. Hence, the need for the use of small return pipes run vertically, or if necessarily horizontal—small, short and well above boiler water line. The head necessary for the return of water can then be more readily formed with a minimum of volume.

We commonly speak of water backing out of a boiler, but its lowered water line may be due rather to condensate withheld from the boiler simply because this condensate lacks sufficient head or differential pressure for its return against boiler pressure. Thus, with insufficient head, water can be either blown back from the safety loop or accumulate from condensation within equipment. In any event, the horizontal top of the safety loop permits steam to exert its pressure against the returns, the same as it would do if there were no loop. The safety loop therefore, is not a device for returning water to the boiler as some vaguely think of it.

The maximum lowering previously given as 6.3 inches may not damage a boiler even if the crown sheet is bare of water, provided, however, there is no sudden contraction of boiler metal due to a flood of relatively cold water suddenly returning over hot bared surfaces. At least, this has been proved in the laboratory with former boilers of heavier construction. One safety factor is that the mentioned lowering may never be achieved, because the balancing column height of water in the returns may be reached before much of the lowering can take place. A few lowered inches of water, when spread over the large area of a boiler, unless the boiler is of unusual small water content, will fill the relatively small volume of vertical returns to the balancing height. Sometimes

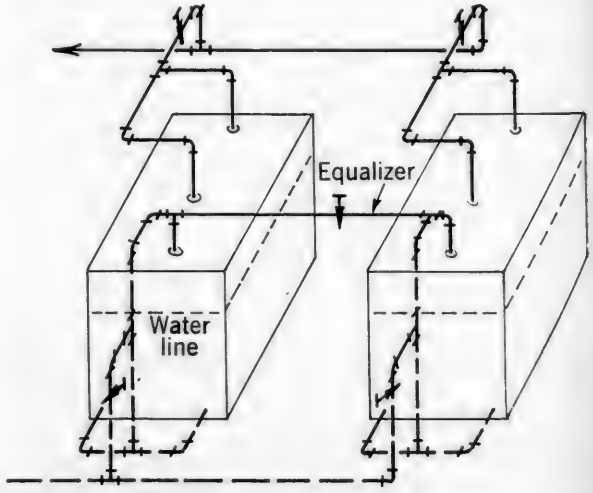


Fig. 5. Safety loop with true equalization.

even provide enough water to fill long horizontal reasonably sized returns too near the water line, and possibly in some cases also enough to flood the large volume of a coil.

But there are often installations where a large volume of water may be required to fill horizontal steam or dry return mains before a head can be built up in risers. For example, in a former home of mine which had a round steel boiler with about 600 sq ft of load, an 1½ inch safety loop submerged 2 inches would lose 3.8 inches of water or 0.41 cu ft. This amount could build up a head in risers only after it had back filled the horizontal one pipe steam mains having a volume of 4.7 cu ft. The boiler had a water volume of 4.4 cu ft and the risers 1.8 cu ft. Such a boiler under maximum load with piping tax included, no controls, and condensate withheld by a sufficient differential, could run dry by evaporation through the steam outlet before the head necessary to the return of condensate could be built up.

So the safety loop is sometimes helpless as a safety device, and, as commonly submerged to avoid the troubles inherent in itself, often provides but theoretical protection. It would be most helpful where a break or serious leak from corrosion or mechanical injury occurs in a wet return or in a dry return not far enough above the boiler water line, or where the steam supply valve is colsed. If, however, the steam valve is closed for a protracted period, it is conceivable that the boiler water could be evaporated backward to the system through the horizontal top of the safety loop.

Use of Check Valves

A properly working 15 degree check valve will prevent backflow from a boiler, and a well designed safety loop will prevent not too much backflow. Neither one will prevent condensation from collecting and building up to required column heights, although there are many who seem to believe they will do such things. Although a check valve can be used to give some protection to a boiler, such valves are not as dependable as a safety loop when properly designed and installed.

Check valves sometimes fail to close or leak when closed and do require added column height to lift their flaps, particularly so as they age. With boilers in battery, they soldom work together, due to slightly differing boiler evaporating rates and resistances from age or size. One may open and pass all the flow. The best protection for both boiler and coils would be a pump, preferably a vacuum pump, to prevent backflow and offset any vacuum forming in equipment which could retain condensate and require unreasonable build up of head for condensate return to the boiler.

Use of a Wye Fitting

When a vacuum system is used, there is but slight chance of any break in the limited piping between the boiler and pump. There is very little need of a safety loop. Where there is more than one boiler, it may be more desirable in some cases for ideal equalization between boilers, but here again troubles may ensue due to the introduction of the loop, particularly so when a wye fitting is used at the water line instead of the more usual tee, close nipple and 90 degree ell.

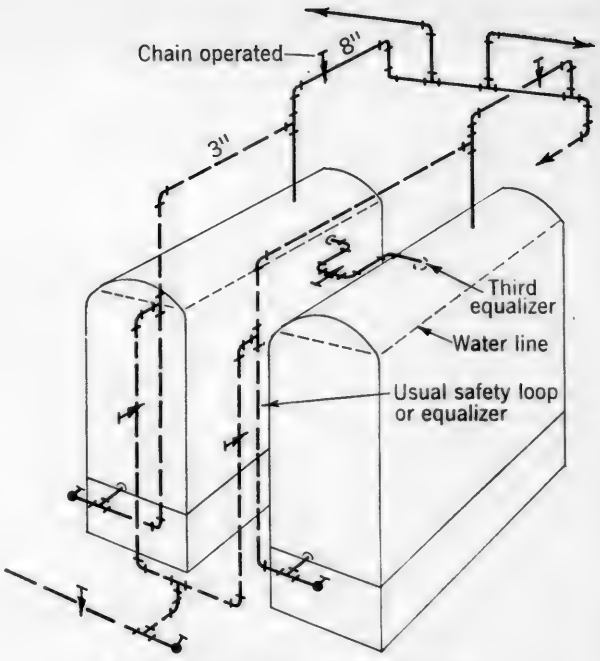


Fig. 6. Safety loop with third equalizer.

Although the wye fitting gives least chance of trapping steam with resultant noise, and does maintain rather closely the real boiler water line, it can cause sudden contraction of boiler metal and more pounding by the injection of cold return water from the pump into a hot water boiler. This is especially true upon cold start up, with cooled buildings intermittently heated, boiler of small water content, pump of excess capacity, too much discharge at a time, or insufficient size of the pump discharge pipe or the steam equalizing pipe to the top of the loop. The pump may inject water up the equalizing pipe, especially if not of enlarged size. A pump with 20 lb discharge against 0 to 2 lb steam pressure on the boiler, will give considerable injection into the boiler with condensate of 70 to 80F suddenly mixed into water of 212F or more. The simplest way to remedy this condition is to connect the pump discharge into the return header and dispense with the safety loop.

More care is required to install a wye fitting at the required height than with a tee fitting, but in either case the pipe fitter does not always fix the proper elevation and make the right connections. Furthermore, wye fittings are not readily obtainable during material shortages and are usually not conveniently at hand.

In previous articles, the writer has proposed the use of the wye fitting as generally the preferred fitting to reduce steam and water surface contact, eliminate steam trapping, and maintain true boiler water line. Although with time many installations have made use of this fitting, I have never seen it mentioned in any book until recently in a recognized work where it was acknowledged as preferable although dampered by illustrating the opposite.

Valving and Connections

To make a loop more safe, there should be no steam valves in the loop and preferably none in the return.

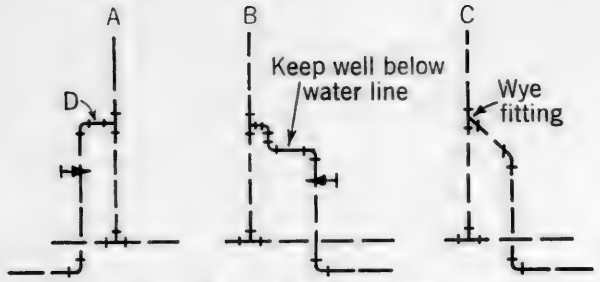


Fig. 7. Safety loop alternates.

There really should be not steam valves even outside of the loop. A boiler needing a hydrostatic test occurs so rarely that the steam main can be blanked off; on other occasions where a valve might sometimes be desirable, drafts can be closed or fires banked and covered with ashes temporarily. There is no necessity for valving a boiler just for valve closure during flushing out since this should be done throughout the entire system. If this is not done, dirt will be circulated back in time and thus make necessary more frequent cleanings. Some water treatments do not even require a flushing out.

It saves piping to take the steam equalizer from a vertical rise from the boiler as in Fig. 2 and 6. The steam equalizer is then less likely to pound, since no condenstate drains from the steam mains, a thing to avoid where return water is injected by a pump. In Fig. 5 the equalizer can have very little pressure drop because of the negligible weight of steam flowing through it. Only the flow needed for equalization between the two boilers occurs.

Sometimes the horizontal portion of the safety loop is set too high, due to carelessness or the theory that any air in the return system will be liberated above the boiler tubes from whence it can travel out to the system for ultimate relief at some point. The intent is to keep corrosive air bubbles away from the boiler tubes, but this is a theoretical contention, not a practical one, since the return water, being colder, reabsorbs air and does not liberate it.

Additional Equalization for Two-piece Boilers

A battery of two steel boilers of two piece construction requires a simple inexpensive third equalizer as shown in Fig. 6. Side circulating connections provide the only passage for water flow from firebox to shell, hence each boiler is in effect two boilers. Most of the water is up in the shell, and the shell and firebox have different zones of heating surface and steaming rates. The shell contains the indirect heating surface, but the firebox has a lot of direct heating surface with a heat absorption value ten times that of the indirect. This valuable direct surface is quickly chilled by the opening of fire doors, but regardless of this, one boiler may reverse its flow at different ratings while the other continues to circulate in the normal direction. The two-piece boiler, a fast circulator, is sensitive to anything tending to vary the water level of one boiler from the other, to firing rate, load demand, or variance in nozzle size of any two boilers. Differences in water levels occur in but a few moments.

Edge Insulation Methods for Concrete Slab Floors

Because concrete is a good conductor of heat, a concrete floor placed on the ground will be relatively cool in the region near outside walls in cold weather. Various methods for overcoming this objection have been considered by the building industry. One which has attained considerable usage is the insulation of the slab edges exposed to the outside temperature. A systematic study, recently completed by Harold R. Martin, P. R. Achenbach, and R. S. Dill of the National Bureau of Standards under the sponsorship of the Housing and Home Finance Agency, has shown that edge insulation does in fact reduce cooling at the exposed edges of the floor slab, and has provided quantitative data on the relative merits of different methods of edge insulation.

Using a special structure, with necessary refrigerating apparatus and auxiliary equipment, nine concrete slab floor specimens were subjected to temperature conditions simulating those to which such floors in basementless houses are exposed during cold weather. The exposed edges of the several specimens were insulated in different ways to determine the effect of eight methods of edge insulation on floor surface temperature and the possibility of condensation. With a simulated outdoor temperature of 0 F, the temperature of the floors with edge insulation was found to be from 9 to 13 degrees F higher at a point 1 inch from the cold wall and the average temperature of the 30-inch border next to the cold wall was from 3 to 5 degrees F higher than that of the floor without edge insulation. The tests showed that condensation, which probably would occur on uninsulated floors under certain conditions, can be prevented with the installation of edge insulation.

Because the temperature of the air over the floors in the test space varied somewhat for the four tests, the various specimens were compared on the basis of the difference in floor surface temperature between a station 62 inches from the cold wall and the average temperature on a 30-inch border adjacent to the cold wall. When the cold space temperature was maintained at 0 F this temperature difference ranged from 4.1 deg F to 5.8 deg F for the insulated floors and was 9.1 deg F for the uninsulated specimen. Of the insulated floors, the slab insulated with a vertical piece of rubber board 2 inches thick and 18 inches deep had the warmest border and the specimen with fiberboard ¾-inch thick at the slab edge and between slab and footing had the coldest border.

The floor surface temperature near the interior of the cold wall was of particular significance insofar as surface condensation on the floors was concerned. Condensation was observed on the floor with the uninsulated edge, but did not occur on any of the floors with insulated edges. The floor surface temperature observed at the edge of the uninsulated floor when the cold space temperature was 0 F was such that condensation would occur for relative humidities above 44% in a 70 F room. Condensation would not have occurred on the poorest of the insulated floors until a relative humidity of 59% was reached in a 70 F room under corresponding cold space temperatures.

COOLING HOT SPOTS IN INDUSTRY

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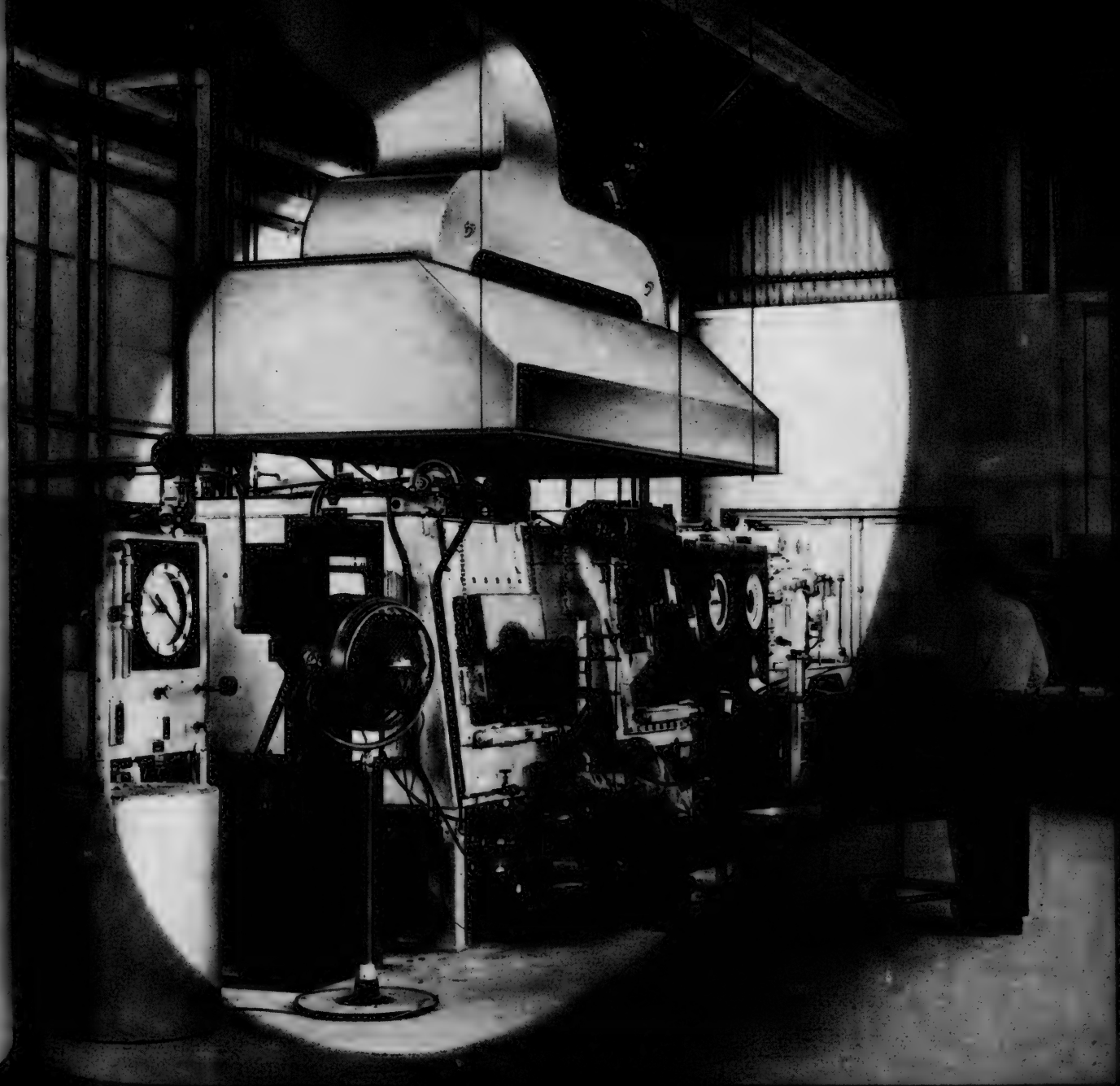

Cooling Hot Spots in Industry

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Industry is constantly faced with the physiological adjustment of personnel who either operate or work near heat producing equipment. Corrective measures for reducing excessive temperatures can be determined by evaluation of the element sources producing heat. Then an adequate system for cooling hot spots can be determined.

TO understand the problem of cooling hot spots in industry, it is well to analyze the product that is to be cooled—the human body.

Physiological adjustment of the human body for health and comfort depends on body heat production, balanced against heat loss. Heat generation of the body evolves from the process of metabolism determined by the consumption of oxygen and the amount of food consumed. A normal person at rest generates 390 Btu per hour, although this varies to a slight degree with age and sex. Increased physical activity results in increased generation of body heat and an equivalent loss of heat to the surrounding atmosphere by radiation, evaporation, and convection.

Radiation of body heat is the emission or diffusion of heat waves from the surface of the body through space to a solid. It is termed sensible heat and is expressed in Btu per hour. The rate of radiation is a function of the difference in temperatures between the two bodies and their distance apart.

Evaporation. This type of body heat loss is by evaporation of moisture from the lungs (respiration) or surface of the body (perspiration) transferred to the surrounding atmosphere. It is termed latent heat and is expressed in Btu per hour. The rate of evaporation is a function of the surrounding air, vapor pressure difference (relative humidity) and rate of air motion (velocity).

Convection. This body heat loss is by transfer of body heat to the surrounding air. The rate of heat transfer depends on temperature difference between the body surface and surrounding atmosphere and the rate of air motion-velocity. The body heat loss by radiation is equal to the heat transmission by convection.

The body heat produced for various degrees of work activity, expressed in heat loss by convection and radiation (sensible heat) and evaporation (latent heat) is shown in Table 1, taken from the ASHVE Guide.

TABLE 1.—HEAT GENERATED BY THE HUMAN BODY IN 80F ENVIRONMENT

Degree of Activity	Total Heat Average, Btu per Hr	Sensible Heat Loss, Btu per Hr	Latent Heat Loss, Btu per Hr
Seated at rest	350	195	155
Seated, very light work	400	195	205
Moderately active work	450	200	250
Light bench work	750	220	530
Moderately heavy work	1000	300	700
Heavy work	1450	465	985

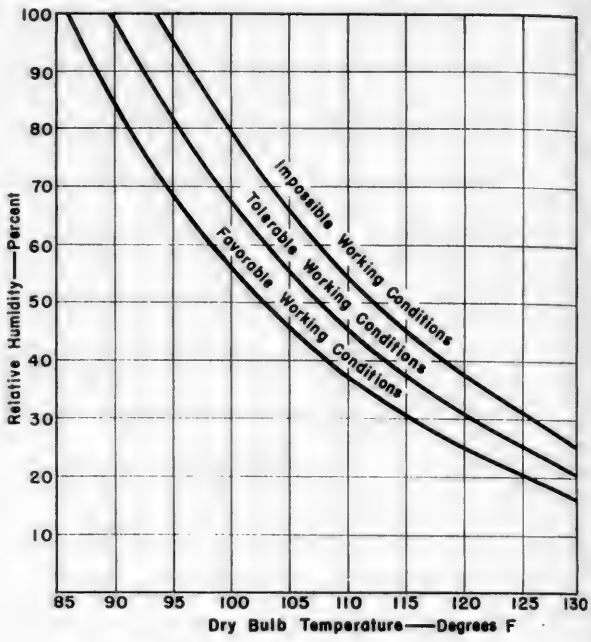

Fig. 1. Hot comfort air conditions.

The human body is a complicated mechanism and nature will adjust a heat balance through a wide range of normal climatic environments. When the surrounding atmosphere temperature rises above the body surface temperature, the body heat loss is restricted. Then the body sweat glands function to maintain the heat balance by perspiration and evaporation. As long as the evaporation and resultant latent heat loss is adequate to maintain the heat balance, the body will regulate normally.

The surrounding atmospheric conditions which function to effect body heat balance are: Temperature, relative humidity and air motion.

Temperature. When the body temperature is below the surrounding atmosphere temperature, body heat loss is restricted. As the environment temperature increases, the blood flow in the body increases and the body is unable to effect a heat balance. As the air temperature rises above 105F, the excessive heat results in body symptoms of heat exhaustion, circulatory failure, fatigue, dizziness, headaches, physical and mental distress. This is the Hazard Zone and results in reduced physical activity, sickness, and frequent accidents. Physical work in a hot atmosphere results in a loss of efficiency and production declines progressively as the temperature rises.

Relative Humidity. The effect of relative humidity on the physiological adjustment in hot environments is reflected in the mean body surface temperature. Relative

humidity affects body thermal sensation by regulating the rate of evaporation of the accumulated perspiration on the body surface. It is the evaporative cooling effect which supplements body heat loss from radiation and convection. Relative humidity environment indirectly affects body heat losses by altering or lowering the body surface gradient temperature. Low relative humidity increases the rate of body heat loss by evaporation and causes a reduction in heat loss by radiation and convection. This results in a cooling sensation.

After the period of initial rapid physiological adjustment, the relative humidity determines the body surface temperature by increased rate of evaporation of accumulated perspiration. This results in an effective sensation of cooling.

In very hot atmospheric conditions, relative humidity is the limiting factor and the wet bulb temperature is the controlling factor. The recognized limit of human endurance when working, is 88 to 90F wet bulb. It is evident that the important factors in the control of atmospheric conditions in hot environments is maintenance of minimum wet bulb temperatures and, in addition, low relative humidities.

Air Motion. The human body normal skin surface temperature is controlled at approximately 94F. Exposure of the body, to rapid movement of high temperature air, results in overheating by convection. A sensation of cooling in hot areas is most effective with rapid air motion by a differential of 10 to 15 degrees below the skin surface temperature to control the body thermal equilibrium. Air velocities of 300 to 600 fpm at 10 to 15 degrees below body temperatures will have a cooling sensation of 4 to 6 degrees effective temperatures below the surrounding hot atmospheric temperature.

Hot Comfort

Precise physiological observation of man to determine the degree of relief from hot areas is difficult to evaluate. The zone of thermal relief or hot comfort differs for each human's physical condition—age, season of the year, geographical location, and many other controlling factors. Comfort in hot areas is determined by combinations of temperature, relative humidity and air motion at reduced temperatures, which together induce a feeling of thermal comfort or "hot comfort." The relation of relative humidity and dry bulb temperature to suitable working conditions is shown in Fig. 1.

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He was an infantry officer in World War I; during World War II he was in the Signal Corps, Quartermaster Corps, and The Adjutants' General Office, Washington, D. C., as Lt. Colonel.

Mr. Wason is the author of many articles on air conditioning and the Industrial Process Air Conditioning Section of the Plant Engineering Handbook. He is a member of the National Society of Professional Engineers.

Types and Source of Heat from Heat Producing Equipment

Correlating man's acclimation factor with various combinations of temperature, humidity and air motion in relation to the heat producing factors, together determine an adequate system for relief cooling of hot spots. Evaluation of the process heat load—heat produced by equipment and released to the atmosphere in the working area—is a problem of some concern. The magnitude of the heat producing factors has been frequently underestimated or misunderstood. Process heat may be classified into two types:

1. *Heat with Moisture*—where steam or moisture is released to the working atmosphere adding both heat and moisture causing exceedingly high humidity and wet bulb temperatures and frequently a room fog.
2. *Heat with Little or No Moisture*—where hot industrial operations release large quantities of high temperature heat to the working atmosphere with little or no moisture added. The dry heat process is the most general and universal problem encountered in the cooling of hot spots in industry.

Heat with Moisture Industries

Some typical industries in which are found heat with moisture (wet heat) are:

Textile. Elimination of heat, fog and condensation in dye houses, bleacheries and finishing departments, ma-

TABLE 2.—POUND OF WATER EVAPORATED PER HOUR FROM FREE WATER SURFACE PER SQUARE FOOT, AT 70F ROOM TEMPERATURE, FOR VARYING WATER TEMPERATURES AND AIR VELOCITIES

Air Velocity, FPM	Water Temperatures—Degrees F									
	110	120	130	140	150	160	170	180	190	200
20	0.187	0.278	0.394	0.548	0.730	.950	1.22	1.55	2.00	2.42
40	0.202	0.300	0.425	0.595	0.790	1.03	1.33	1.68	2.17	2.66
60	0.217	0.323	0.468	0.637	0.850	1.10	1.42	1.81	2.33	2.82
80	0.233	0.346	0.490	0.685	0.910	1.19	1.53	1.94	2.50	3.02
100	0.248	0.368	0.520	0.728	0.968	1.26	1.62	2.06	2.66	3.22
200	0.324	0.480	0.680	0.950	1.27	1.65	2.16	2.70	3.47	4.20
300	0.400	0.595	0.842	1.18	1.56	2.04	2.63	3.33	4.30	5.20
400	0.478	0.710	1.00	1.40	1.86	2.43	3.13	3.97	5.12	6.20
500	0.550	0.820	1.16	1.62	2.16	2.82	3.62	4.60	5.92	7.17
1000	0.940	1.39	1.97	2.75	3.66	4.78	6.13	7.78	10.0	12.20

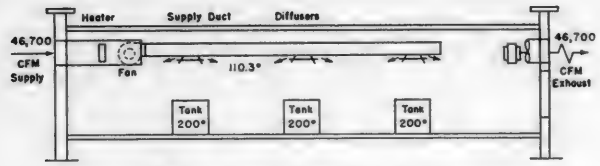


Fig. 2. Vapor absorption system.

terially reduces seconds, rejects, and maintenance of plant. Satisfactory working conditions are maintained through a vapor absorption system.

Paper and Pulp Mills. Where the material in process carries a very high moisture content and vapor free air is a requirement of all machine, beater and grinder rooms. Satisfactory working conditions are maintained through a hood exhaust system.

Steel and Metals Goods. Pickling rooms require a combination system of vapor absorption and exhaust ventilation for human comfort and increased life of all equipment.

Food Industries. Kettle, canning, blanching, bottle washing and bottle filling areas have to be conditioned and heat relief for personnel provided.

Process Industries. Vapor absorption systems or combination systems are applicable in electro-plating, coating and chemical processes.

Wet Heat Process Systems

The function of a vapor absorption system is to supply throughout the process area, a blanket of warm or tempered outside air of low moisture content in sufficient quantity to maintain the dew point temperature of the area below that of the surrounding walls and ceiling, this eliminates excessive heat and fog, and prevents condensation on walls, ceiling and room contents. A hooded exhaust system removes moisture-laden air equal in volume to the supply air, in order to relieve the heat and to maintain an approximate constant area dew point.

Vapor Absorption System. This comprises tempering heater coils, under automatic control, supply fan with drive, and a system of galvanized iron, copper or composition distributing ducts. Supply air is taken from outside or adjacent heated areas where dry air is available.

Hooded Exhaust System. Such a system is generally designed to draw vapor laden air from the upper part of the room by means of ducts or a combination of exhaust hoods with ducts and exhaust fans. Removal of vapor with exhaust fans, hoods and ductwork alone will give fair results during warmer months when windows are open, but will produce fog and condensation during colder months. This procedure may result in uneven distribution causing wet areas, and hot or cold spots due to outside air entering through leaks or doors.

Design Data. Data for determining vapor or moisture emitted to surrounding atmosphere from free surface of dye vats, kettles and tubs are given in Table 2.

Calculations for Vapor Absorption System

The air volume is determined for winter operation by the differential in the carrying capacity of the air (grains per pound) between the outside air and the internal moisture laden air. A vapor absorption system is illustrated in Fig. 2. Let us consider a problem for which the following design data are given:

1. Process—textile bleachery.
2. Mercerizing tanks—1,000 sq ft (free surface).
3. Temperature of water in tanks—200F.
4. Air velocity over tanks—60 fpm.
5. Conditions outside—0F; inside, 90F DB, 50% R.H.
6. Building transmission losses—walls, windows, ceiling; 960,000 Btu per hour (internal sensible heat gains included).

Calculations

1. From Table 2, water evaporated from free water surface of tanks at 200F, velocity 60 fpm equals 2.82 pounds water per hour per square foot. Then, 1000 sq ft x 2.82 lb per hr per sq ft = 2,820 lb water per hour.

2. Grains per Minute

$$\frac{2820 \times 7000 \text{ grains per pound of water}}{60} =$$

329,000 grs per minute

3. Room conditions, 90F DB,

50% RH = 68.7F DP =	105.5* grs per lb of air
Outside conditions 0F DB	5.5 grs per lb of air
Difference—carrying capacity of air	100.0 grs per lb of air

4. Air Volume

$$\frac{329{,}000 \text{ grs per minute}}{100 \text{ grs per pound}} = 3.290 \text{ lb of air per minute}$$

3,290 lb air per minute x 14.2* cu ft per lb (90 DB, 50% RH) = 46,700 cfm

5. Building Transmission Losses

960,000 Btu per hour ÷ 60 = 16,000 Btu per minute

One pound of air requires 0.24 Btu per one degree rise in temperature (specific heat).

$$\frac{16{,}000}{3290 \times 0.24} = 20.3 \text{ degrees temperature rise}$$

90F DB + 20.3F = 110.3F DB temperature entering air to space or temperature leaving the tempering air heater coil.

6. Vapor Absorption System—Winter Heating and Ventilating Requirements
   a. Fan—46,700 cfm
   b. Heating coil—to heat 46,700 cfm from 0F to 110.3F
   c. Supply duct distributing system
   d. Exhaust system 46,700 cfm

*From psychrometric chart.

TABLE 3.—COLOR GUIDE OF TEMPERATURE

Color	Temperature, Deg C	Temperature, Deg F
Starting red heat	500-550	932-1022
Dark red heat'	650-750	1202-1382
Bright red heat	850-950	1562-1742
Yellowish red heat ...	1050-1150	1922-2102
Starting white heat ..	1250-1350	2282-2462
White heat	1450-1550	2642-2822

Illustrations of the Dry Heat Process

Some typical illustrations of the dry heat process or heat without moisture in industry, requiring cooling of hot spots employing unit or central station systems with fan, drive and supply air ducts for heat relief are:

Steel Industry—Strip tinning and molding mills, furnaces, foundries.

Aluminum Industry—Sheet mills, forming mills, foundries, aluminum fabricating plants.

Metal Process Industry—Furnaces, moldings, castings, metal heat treating foundries, piston rings, bolts and nuts manufacture, lithographing tin can manufacture, wire drawing.

Rubber Industry—Rubber molding presses, automobile tires.

Glass Industry—Glass yarns, mats, moldings and forming departments.

Electrical Industry—Radio tubes, electric lamps, motor-generator sets and switchgear, electronic tubes, electric furnaces, electric generating stations.

Chemical Industry—Plastic moldings, ceramics, baking ovens, hydraulic presses, sugar refineries.

In addition, there are many other industries too numerous to mention.

Heat from Hot Industrial Operations

To evaluate the magnitude of heat produced from hot industrial operations, the true nature of the source of heat must be recognized. The magnitude of heat produced from hot processes is so great that internal heat produced by workmen, lights and motors are frequently ignored. Heat gains from high temperature process equipment discharging to surrounding atmosphere or adjacent structures may be classified into four general methods:

1. Transmission heat from process equipment surfaces.
2. Radiant heat from process equipment surfaces.
3. Direct heat—open flame or electric heater.
4. Infra-red radiant heat.

Transmission Heat

Transmission heat is the conduction of heat from the primary source through the walls of the hot process apparatus and conveyed from the hot surface to the air or space. This heat is conveyed by the convection component —hot air currents—and escapes into the space. Thermal conductivity is the time rate of transfer of heat by conduction, through unit thickness, across unit area, for unit difference in temperature in order to determine the heat emitted to the surrounding space by convection.

Transmission by convection heat losses from process machinery in Btu per hour can be calculated by estimating the apparatus surface area in square feet, then multiplying by the difference between the internal and external temperatures, times the coefficient of heat transmission factor. The surface area and temperature differences are generally readily obtainable. The coefficient of heat transmission may be determined through use of standard reference books, then calculated for the combination of materials and adjacent air current velocities involved.

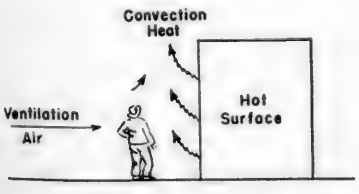


Fig. 3. Radiant heat —no shielding for worker.

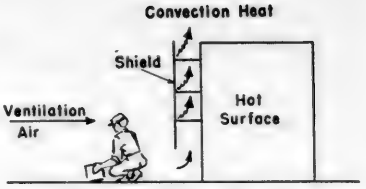


Fig. 4. Shield gives protection from radiant heat.

Adequate insulation of hot surfaces will lower the transfer of heat to the air, thus minimizing radiation heat losses.

The process heat is emitted outward from the hot surface until, being absorbed by the air or cooler surfaces of the building structure or adjacent objects, these in turn are heated and give up heat to the space. Approximately 30 per cent of the total heat is radiant heat and is picked up by the adjacent objects. It is evident that the radiant heat is ultimately all added to the space air and must be removed by air movement, that is ventilation (Fig. 3).

An approximate method of estimating the thermal surface temperature of hot metal is by color and a color guide of temperature is given in Table 3.

Radiant Heat

Radiant heat is from invisible energy rays of heat waves actively emitting outward in all directions until intercepted by an opaque surface and transformed into heat.

Radiant heat has no effect in passing through the air itself or on air movement in the surrounding space. The fact that the radiant heat temperature is very much higher than the surrounding air temperature is the reason that the radiant heat load on workmen will be considerably greater than that from the heat from the convection component. Radiant heat, heats every surface within visible range, which in turn re-transfer heat to the building structure or adjacent object.

Radiant heat is the trouble maker, particularly at high temperatures such as hot furnace surfaces, molten metal or semi-finished metal products. Recognition of high temperature radiant heat and control, is of paramount concern for cooling hot spots to bring relief from heat in the work zone.

Effective methods for protection of personnel from radiant heat is by shielding as shown in Fig. 4. Shielding is accomplished by means of interposing between the workmen and the hot surface a reflective metal curtain or by individual protective reflective clothing. A solid shielding reflective material intercepts radiant heat, and in turn re-radiates the heat to the air or adjacent objects and eventually is picked up by the convection air current component. Shielding effectiveness depends upon three factors—reflectiveness, emissiveness (giving up heat) and an intervening air space to prevent short circuiting of heat by conduction.

Radiant heat is absorbed by the shield. Highly emissive surfaces will give up heat to surrounding colder receiving surfaces and cannot be stopped, and the heat eventually is picked up by the surrounding air.

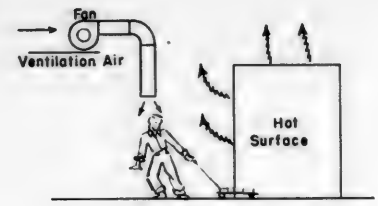


Fig. 5. Man-cooling system.

Finished aluminum sheets are adequately suited to meet shielding objectives and should be placed a minimum of 10 to 12 inches away from the hot surface. The shield should be 6 to 10 ft high, open at the bottom, to produce an unobstructed chimney effect, and should be readily removable for service and maintenance of hot process equipment.

In some instances, shielding has resulted in a lowering of temperature in the work zone as much as 20 degrees and possibly 30 degrees. It is the simplest and cheapest method to obtain effective radiant heat relief when combined with ventilation.

Direct Heat

Direct heat is the total heat emitted by the combustion of an open flame. Generally this problem is local and affects an individual operator at the process machinery. The heat produced is directly proportional to the fuel used and can be readily calculated. The correction is similar to the previous discussion for radiation or radiant heat by ventilation with exhaust hoods or shielding when practicable.

Infra-red Radiant Heat

Infra-red radiant heat is encountered in industry from incandescent bodies where workmen are required to look at light of high intensities, as in oxyacetylene and electric welding, cupola tending, open hearth and electric furnace operations, foundry pouring and inspection of fire boxes and kilns. Infra-red rays are present in dangerous quantities in any combustion or incandescent light over 1,800F. Infra-red lamps are also used in certain industries for drying and baking.

The greatest hazard of infra-red rays is damage to the unprotected eyes which absorb and transform these rays into heat energy. Continuous exposure will cause permanent damage to the retina of the eye, cloudiness, and eventually decreased vision. The last stage is possible blindness.

Workers exposed to infra-red radiation should be provided with and required to wear goggles, helmets, shields or masks equipped with colored lenses especially designed to exclude the kinds and intensities of rays met, to protect the eyes.

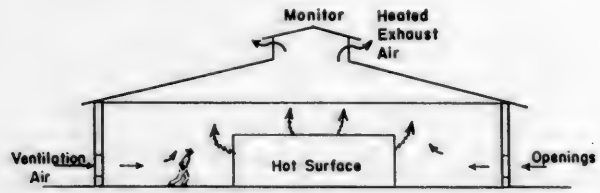


Fig. 6. Gravity or natural ventilation system.

Heat Determination from Hot Surfaces

To determine the heat dissipation from hot surfaces, calculate the heat input to the process machinery, then effect a heat loss balance and the proportion of heat effective in the work zone. To calculate the heat input to the hot equipment, obtain the rated capacity of the process equipment such as the consumption of fuel, coal, oil, gas, steam or electricity in heat units per hour.

Refer to a standard engineering handbook for selection of *Btu per lb, Btu per cu ft* or *Btu per kw* of these heat producing elements, then by multiplication, the total heat input can be computed. The original equipment manufacturer is a reliable source to obtain information as to heat input to their equipment for the particular process involved. The heat lost or dissipated from the hot process to the surrounding area or to atmosphere is by radiation, convection currents and radiant heat from either the product or equipment, and is equal to the heat input.

The objective is to determine the heat dissipated from the hot equipment or product into the surrounding space, particularly the level of heat, where workmen are exposed. This heat determination requires a thorough knowledge of the particular hot industrial process, weighed by good engineering judgment. The engineering field is subject to a wide variance in personal interpretation as to the techniques involved at this stage of development in predicting heat dissipated into the work zone.

A certain degree of accuracy for determining the heat gains in the work zone can be obtained by analyzing the four methods of heat gains. Then the corrective methods for heat relief can be developed.

The corrective methods employed may be classified:

1. Man cooler
2. Gravity ventilation
3. Forced ventilation
4. Cooling by evaporation
5. Cooling with refrigeration

Man Cooler

Basically, a man cooler is a unit system with a fan mounted on a mobile pedestal recirculating room air discharging directly toward the workmen as in Fig. 5. This unit system has merit when the hot process involves limited radiant heat and when the room environment temperature is not over 95 F. Its value seriously diminishes at temperatures of 105 F and above, because body exposure to rapid air motion results in overheating through convection. A continuous blast of hot air is unbearable and objectionable to the workmen.

Gravity Ventilation System

Gravity ventilation is based on the consideration that

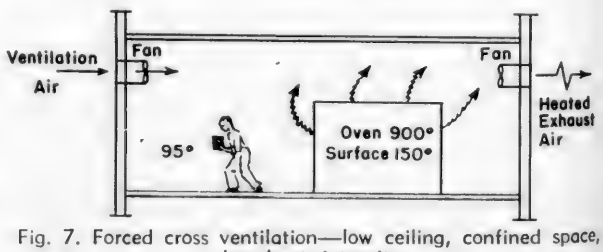


Fig. 7. Forced cross ventilation—low ceiling, confined space, low heat intensity.

neat dissipation from the hot process is conveyed by convection, rising hot air currents, and exhausted through large openings in the monitor roof or gravity operated roof ventilators as in Fig. 6. Gravity ventilation is also termed natural ventilation. The objective is to provide window or side wall openings to introduce outside cooler air to the work zone before it absorbs heat from hot equipment and rises by convection air currents to escape through roof openings.

The gravity system of ventilation fails at times because the greater portion of heat given off by the hot process is radiant heat transferred to surrounding surfaces and not by conduction to the air. This results in outdoor air coming in contact with heated surfaces before reaching the work zone, and causes local recirculation of hot air currents within the space. To control the high rate of gravity ventilation, requires large openings for incoming air and escape air openings generally too large for natural ventilation within building spaces available for openings. The incoming air distribution in relation to the hot process is difficult to maintain, resulting in excessive heat in the work zone. The gravity system, although least expensive, is inadequate to meet requirements for cooling of hot spots and has limited application in hot industries for heat relief.

Forced Ventilation System

Forced ventilation is predicated on the analysis of the heat problem and recognition of the true nature of the heat process and the delivery of cooler air by positive fan supply to the point of heat source. Forced ventilation is three to four times more effective for cooling hot spots, to provide heat relief in the working zone, than the gravity ventilation system.

The principal involved is to supply cooler air to the work zone at the floor where 15 to 20 per cent of the total heat is dissipated from the hot process and which primarily determines the heat level for the workmen. See Figs. 7, 8 and 9. As previously stated, the total heat is eventually dissipated to the surrounding air. Therefore, ventilation air is the most practical means of removing the accumulation of heat within the work areas. Air is the carrier of heat exhausted to the atmosphere.

Ventilation is a problem of displacement of air, thus both positive supply and exhaust equipment are required. Supply air that goes in must go out. It is erroneously believed, in some cases, that ventilation rates of the two systems, supply and exhaust, are additive, but such is not the case. An effective cooler work zone heat level will result only when outside air is supplied at 10 to 15F cooler than body surface skin temperature and an equal quantity of heated air is exhausted.

A forced supply ventilation system, when combined with a gravity hood exhaust system, as in Fig. 10, is only applicable within an enclosed space that is reasonably air tight; otherwise short circuiting of air will result, reducing effectiveness.

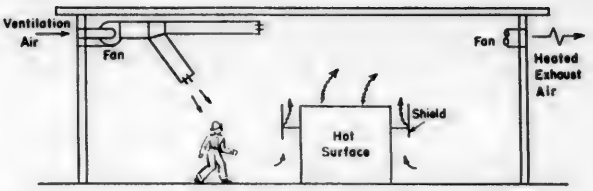


Fig. 9. Forced ventilation—spot cooling, directional outlet, high ceiling—high heat intensity.

Outlets and Velocities for Forced Ventilation

The ideal spot cooling method of distribution of air, when heat conditions are serious, is to discharge the cooler air close to the floor line in front of the workmen, directed toward the waist line. A man can stand a breeze of cooler air from in front far better than from the rear. When this ideal solution is not practical, overhead directional distribution will suffice. The grille outlet should be directional, under manual control; flexibility of the air pattern is essential, so that the workman is free to direct the cool air on his face or shoulders or any other air path desired. It is a fallacy to install a fixed grille. The workmen will complain and fight the system instead of being grateful for it.

The outlet air velocity should vary as the distance from grille outlet to the workmen increases. The air velocity discharged from a grille dissipates very rapidly even when the flow of air is unobstructed. The greater the distance from the outlet along the axis of flow, the greater reduction in air velocity. A rule-of-thumb method of determining air outlet velocity is to allow 100 fpm velocity for every foot of distance from the workmen. For example, if the workman is 6 ft from the outlet, then the outlet velocity is 600 fpm; if 10 ft away, 1,000 fpm velocity. This method, although only an approximation must be considered along with the intensity and magnitude of the heat. The greater the heat, the greater the individual volume of outside cooler air at higher velocities is required. For heat relief in intensive heat areas, velocities as high as 3,000 fpm have been employed successfully.

Precautions in Spot Cooling Using Forced Ventilation

Several precautions in cooling of hot spots must be observed with forced ventilation.

1. The practice of opening immediate adjacent windows or in the case of monitors, short circuiting of fans, is instrumental in sabotaging the effect of the ventilation system.
2. Air suplied from adjacent areas at higher temperature than outdoors, to the space being ventilated, reduces effectiveness.
3. Exposure of supply outside air ducts, through heated

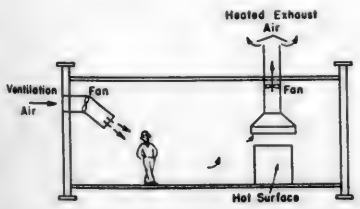
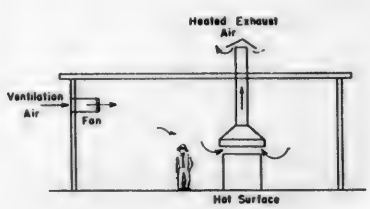


Fig. 8. Forced ventilation—spot cooling, directional outlet, hooded exhaust, high ceiling height, medium heat intensity.

Fig. 10. Forced ventilation with gravity exhaust—direct heat from gas or electric heaters.



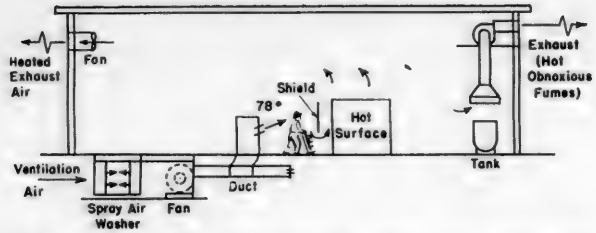


Fig. 11. Forced evaporative cooling system, air outlets near floor, high ceiling, extreme heat, and obnoxious hot fume exhaust.

air spaces raising the supply air temperature, reduces effective efficiency.

Cooling by Evaporation System

In applications where a prohibitive amount of air must be introduced to the work zone because of the magnitude of heat, cooling by evaporation will greatly reduce the quantity of air required and reduce excessive temperatures. Or when the outside air reaches a temperature of 95F or higher, the 10 to 15F cooling below body temperature is no longer available and thus it becomes a hot blast. Rapid air motion under these conditions will produce increased body perspiration and evaporation but continued or profuse sweating will impose a physiological unbalance of body heat resulting in heat exhaustion. Without resorting to refrigeration, cooling by evaporation is a convenient and simple method of lowering the outdoor air temperature effectively and efficiently for spot cooling.

Cooling by the evaporation-ventilating system is obtained by drawing outdoor air through a water spray type air washer (Fig. 11 and 12). Air passing through an air washer will saturate the leaving air at the entering wet bulb temperature; there is no change in total heat of the air. Within the air washer there is an exchange of heat between sensible heat (lowering of the dry bulb temperature) and latent heat (increase in dew point temperature moisture content of the air), sometimes referred to as adiabatic heat interchange. The spray water is recirculated with a very small volume lost by evaporation and remains the same temperature as the entering wet bulb temperature.

The summer outside wet bulb temperatures for various geographical locations may be obtained by referring to Heating & Ventilating's Engineering Data book. The wet bulb will be 15 to 20F or more below the prevailing dry bulb temperature depending on the geographical locality but is seldom over 78 to 80F. Air leaving the air washer at these lower temperatures will now comply with the requirements for cooling hot spots, that is, 10 to 15F below body skin temperatures. The saturated air leaving the air washer when delivered to the hot space will pick up heat rapidly thereby lowering the zone space temperatures. The space relative humidity will only be slightly affected because of the magnitude of the internal zone heat to be absorbed.

Experience has proven that in cooling by evaporation, the air in supply ducts when run through a hot area will pick up 5 or even 15F before reaching the hot zone. It is therefore in some instances beneficial to insulate the supply ducts and run high air duct velocities to keep air temperature losses at a minimum. Aluminum ducts will reflect heat and in some instances save insulation.

Cooling with Refrigeration

Cooling with refrigeration has a limited application in cooling hot spots in industry. The economies of the application must justify the additional expense. Applications are of two types: (1) cooling the supply air to the hot area or zone and (2) jacket water cooling panels absorbing radiant heat from an extremely hot process. When air is the cooling medium, such as in textile mills, a spray type air washer or dehumidifier of the surface type using water coils for conditioning the air with fan and distributing duct work is employed. In the application of jacket water cooling panels, water is cooled, then circulated through the panels absorbing radiant and convection heat and next returned to the evaporators to be cooled to complete the water cooling cycle. Refrigerated air has application to cooling of electrical and other products in process of manufacture generally in a closed space. The results are beneficial to the employees but when installed as a requirement of fabrication, could not be considered as spot cooling in the implied sense of this article.

Techniques to Remember

1. Maintenance of minimum dry and wet bulb temperatures and low relative humidities for hot comfort.
2. General exposure to industrial heat can be adequately controlled by one or several combinations of ventilating systems applicable to the hot processes to give effective heat relief.
3. Ventilation—a supply of outside air at 10 to 15F below body skin surface temperature and exhaust of heated air is the basic principle for cooling hot spots in industry. Never recirculate heated air.
4. Shielding is the primary approach for reducing radiant heat exposures and emphasis should be given design and application whenever practicable.
5. Hooded exhaust systems from hot process products and equipment should be seriously considered—removal of heat at the source.
6. By far the most effective system for cooling of hot spots in industry is cooling by evaporation—forced ventilation in combination with positive exhaust. This system requires less air, has a lower first cost, and costs less to operate.

The techniques discussed here have met engineers' and p'ant managers' approval, even though predictions of the heat dissipated in hot work zones is subject to wide interpretations. Final results of "heat relief" installations have proven very gratifying.

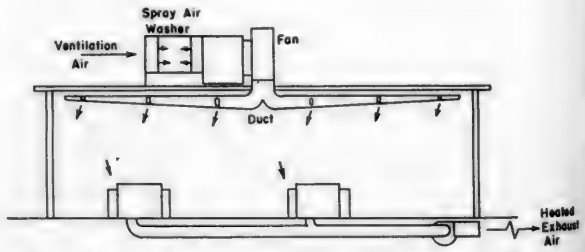


Fig. 12. Forced evaporative cooling system for electric generator cooling. Air is exhausted through generators.

Equipment Selection Forms

for Heating, Ventilating and Air Conditioning Design – Part 1

JOHN W. HABJAN

A number of suggested equipment selection forms are presented to convey to the contractor the type of equipment required so that misunderstandings and costly errors may be avoided.

EQUIPMENT selection for commercial heating, ventilating and air conditioning designs has been given insufficient emphasis in the past or at best it has been given only partial treatment in technical texts. Since it has been rather neglected and since it is an essential part of every heating, ventilating and air conditioning design project, forms are presented as a means of focusing more attention on this important subject.

This information is being presented as a two-part article. Part I covers fans, filters, and heating and cooling coils; Part II to follow covers pumps, compressors, condensers and cooling towers; boiler, oil burner and combustion chamber; heat exchangers and humidifying sprays.

It is an established fact that an engineer selecting equipment must choose such apparatus which (1) will satisfy the basic requirements of design in the fields mentioned, (2) which will most suitably meet the needs of the prospective owner of the systems, and (3) which can be readily purchased by a contractor.

In addition, the engineer must make it clear to the contractor through his drawings and specifications, precisely what type of equipment is required, in order that no misunderstanding will arise during the construction phase of the project.

If these drawings and specifications are not prepared carefully, after selecting the correct equipment, the contractor may inadvertently purchase such mechanical items which will meet only a part of the design requirements. This may consequently result in construction delays or in field changes at (1) expense of the prospective owner and (2) embarrassment to the engineer.

Errors are Avoided

Sometimes incomplete drawings or parts of specifications are clarified over the phone by the engineer, but this is not the best way of doing business especially if there exist means of avoiding such situations. Standardized equipment selection forms for fans, filters, heating and cooling coils, pumps, compressors, etc. can go a long way in giving system components the consideration that they deserve in all stages of design.

The particular forms being presented in this article will (1) simplify and improve equipment selection procedure for the engineer; (2) constitute a reference to the draftsman developing the drawings containing views of the equipment; (3) facilitate the preparation of equipment schedule drawings; (4) aid in the write-up of specifications; and (5) form a permanent part of the design folder of the project for reference purposes.

Although the forms have been developed from the viewpoint of experience in design procedure and awareness of plan development needs, they are only suggestive in nature and are expected to be modified as necessary by engineers to suit particular needs. Some engineering offices do not as a matter of policy give itemized information on their heating, ventilating and air conditioning

SUGGESTED EQUIPMENT SELECTION FORM FOR FILTERS

Project No. _____ Date _____
Building _____ Selected by _____
System No. *_____ Checked by _____
Filter No. *_____ Filter location *_____
Equipment vendor selected for design purposes _____
Type filter *_____; frame size *_____inches × _____inches × _____inches
Nominal capacity per unit_____cfm
Total capacity of filter bank *_____cfm
No. of filter units required = $\frac{\text{total cfm}}{\text{nom. cfm/unit}} = \frac{\text{cfm}}{\text{cfm}} =$ ____
No. of units to be used *_____; arrangement of units*: flat_____; angular_____
No. of units: wide *_____; high *_____; deep *_____
Space to be occupied by filter bank: wide _____inches; high _____inches; deep _____inches
Velocity through filter bank: *_____max. fpm allowable
Friction drop through filter bank: *_____inches w.g. max. clean allowable
No. of ply (if paper mat type) *_____; type paper_____
Power input to unit (if electric type)_____watts; hp *_____
Efficiency rating (if electric type)_____%
Space required for servicing filter bank _____
Safety devices required for filter bank *_____
Sprinkler connection required *_____; size *_____ inches ips
Drain required *_____; size *_____inches ips
Type draft gage required _____
Total weight of filters, frames, etc. _____lb
Equipment vendor (equal) _____
Equipment vendor (equal) _____

SUGGESTED EQUIPMENT SELECTION FORM FOR STEAM OR HOT WATER HEATING COILS

Project No. ———— Date ————
Building ———— Selected by ————
System No. *———— Checked by ————
Heating coil No. *HC- — Coil location *————
Return air, cfm: ————; temp.: ————°F, db
Outside air, cfm: ————; temp.: ————°F, db
Total air, cfm: *————; temp.: *————°F, db (entering coil)
Room heating load (from heating calculations) = ————Btu/hr
Outside Air load = 1.08 X OA cfm X (room F, db — OA F, db)
= ————Btu/hr
Humidifying spray load = 1.08 X total air cfm X *——°F†
= ————Btu/hr
Total heating load on coil * = ————Btu/hr
Required temperature rise through heating coil:

$$\text{Temp. rise} = \frac{\text{total heating load on coil (Btu/hr)}}{1.08 \times \text{total cfm}} = \text{———°F}$$

Required air temperature leaving coil:
Entering coil air temp. plus temp. rise = ——°F plus ——°F
= *——°F
Equipment vendor selected for design purposes————
Model No. ————; rows deep *————; type coil *————
Face area: ————sq ft; face velocity *————fpm (max)
No. of coils required: *——; No. high *——; No. wide *——
Tube length: *——inches; tube face: ( )—— and ( )——;
optg. wt. ————lb
Overall dimensions: length————inches; width————inches;
depth————inches
Piping connections: supply ————ips; return ————ips
Air friction: * dry ————inches w.g.; wet ————inches w.g.;
water friction *————ft
Steam pressure at coil: *————psi; condensate *————lb/hr
Mot. steam valve pressure drop: *————psi (max)
Entering water temp.: *——°F; leaving water temp.: *——°F
Gpm water through coil required:

$$\text{Gpm} = \frac{\text{total heating load on coil (Btu/hr)}}{500 \times \text{(water temp. diff.)}} = \text{*———. .gpm}$$

Factor ( )††:——; factor ( ):——; actual water velocity
————fps
Average water temp.:————°F; hot water factor: ————;
factor K:————
Larger temp. diff.:——; smaller temp. diff.:——; MED——
Equipment vendor (equal) ————
Equipment vendor (equal) ————
Type of automatic controls connected to control valve of heating coil *————
Height of bottom of lowest coil above floor————inches
(18 inches min.)

†Adiabatic humidification will cause drop in air db temp.
††Factors ( ) can refer to the equipment vendor's hot water heating coil selection factors.

SUGGESTED EQUIPMENT SELECTION FORM FOR FANS

Project No. ———— Date ————
Building ———— Selected by ————
System No. *———— Checked by ————
Fan No. *———— Fan location *————

Item Causing Static Pressure Loss	Pressure Loss Calculation	Pressure Loss, Inches of Water
Screen and louver		
Dampers (motorized, fire, volume)		
Filters (Max. clean + 50%)		
Heating coils		
Cooling coils		
Eliminators		
Ducts		
Ducts		
Ducts		
Elbows		
Elbows		
Elbows		
Duct transformations		
Air register (grille, diffuser)		
Net total static pressure loss		
Add (%) safety factor		
Gross total static pressure loss		
Nominal fan static pressure to be selected		

Equipment vendor selected for design purposes ————
Model No. ———— Type Fan *————
Capacity *————cfm; static press. *———— inches w.g.;
approx. bhp *————
Max. outlet velocity *————fpm; approx. rpm *————
class ————
No. of inlets and size width *————; type of arrangement
*————
Rotation and discharge *————; type blade *————
Tip speed ———— fpm; type drive connection *————
Type base *————; type vib. isolators ————
Type motor ————; hp————; rpm ————; voltage————;
phase————
Total operating weight of fan, motor, base, etc.————lbs
Floor space required: length————inches × width————inches
X height————inches
Fan inlet size————inches; fan outlet size————inches
Type of automatic controls connected to fan starter————
Type of fan starter ————
Motor starter interlocked with ————
Is access door required to fan bearing? ————
Outlet velocity and tip speed ranges (from The Guide) for good operation at static pressure selected above: O.V. ————
fpm; T.S. ———— fpm
Equipment vendor (equal)————Model No.————
Equipment vendor (equal)————Model No.————

drawings concerning mechanical equipment performance and characteristics but instead provide only brief identification notations. Nevertheless, these forms could be used to advantage by their engineers in the equipment selection phase of design.

Generally speaking each form is divided into three parts: (1) general identification of the project, building, system, equipment unit, recording date, and persons involved in making the choice; (2) principal calculations necessary to size and select the equipment; and (3) particular information for drafting, specification writing, and record purposes.

Each form must naturally contain the job number of the design project, the name or number of the building under consideration, the specific floor and room in which the mechanical equipment will be located, the number of the system which will contain the mechanical equipment, and the identification number of the equipment itself. The first part of the form must also contain the date on which the equipment was selected, the initials of the person who chose the mechanical equipment, and the initials of the person responsible for checking the selection.

The second part of the selection form consists of the calculations and all the other necessary technical information concerning equipment operating characteristics which

help to determine the size and type of unit required for the job.

The third part of the suggested forms contains the overall physical dimensions of the unit for layout purposes, the manufacturer's model number, special feature information for design and specification write-up purposes, and such pertinent details of the unit which need to be recorded in order to be used subsequently in the selection of associated equipment.

It is the author's personal opinion that there are certain items on these forms which should definitely be included by the draftsman on the equipment schedule drawings in order for the contractor to properly identify the type of equipment required for the job. These items have been marked with asterisks(*). Other equally essential items, not marked by asterisks, are to be used within the design office for layout, design, specification writing, and record purposes. Consequently these later items do not need to be indicated directly on the mentioned drawings.

Since the headings and information blanks on these forms are self-explanatory, elaboration of the forms is not believed necessary. One can very well examine the items and evaluate their usefulness in terms of his own office requirements.

In making a fan or pump selection, it is considered good practice by many engineers, and essential for accurate results, to first draw a single line diagrammatic sketch to scale on the prints of the building floor plans indicating all items in the system which are expected to cause friction and which will contribute to the loss of static pressure in a duct or piping system.

This means that before a fan is selected, the engineer should draw a sketch of the heating, ventilating and air conditioning system showing in their respective locations: Outside air louvers, automatic dampers, filters, preheat coils, cooling coils, reheat coils, fans, elbows, volume dampers, registers, duct sizes, and air quantities (cfm) of all duct mains, branches, and registers. Having done so, the engineer's next step should be to determine the air circuit offering the greatest resistance to flow. Only then should he proceed to make his fan selection.

Generally speaking, no unfiltered air should ever be supplied to or recirculated back to a building space which will be constantly occupied by people. The type of filters to be used depends upon the individual room or system requirements. The filter face surface should be selected to adequately handle the total air flow anticipated without undue static pressure loss. The arrangement of filters will depend upon the space available. Adequate means of access should be provided to allow easy servicing of filters. The form presented can be used for any one of various types of filters: Throwaways, washable, paper fill, self-cleaning, and electrostatic.

Aside from the recommendations given in standard reference books for heating coils and cooling coils, other factors must be taken into consideration. The selection of a coil size should also be dependent on the size of fan casing desired and the aisle space available for the removal of the coil for future maintenance purposes. The vertical dimension of a heating coil or bank of heating coils may be dependent also on the distance between the floor and the bottom of the lowest coil (18 inches minimum) required for trapping the steam condensate return and piping it to the nearest auxiliary condensate pump.

SUGGESTED EQUIPMENT SELECTION FORM FOR COOLING COILS—DIRECT EXPANSION OR WATER

Project No. ———— Date ————
Building ———— Selected by ————
System No. *———— Checked by ————
Cooling coil No. *CC- —— Coil location *————
(Insert information required from cooling calculation sheets)
Room sensible heat load————Btu/hr
Outside air sensible heat load————Btu/hr
Total sensible heat load————Btu/hr
Room latent heat load————Btu/hr
Outside air latent heat load————Btu/hr
Total latent heat load————Btu/hr
Total sensible heat load————Btu/hr
Total latent heat load————Btu/hr
Total cooling load on coil *————Btu/hr
Outside air: ——db; ——wb; room design condition:——db; ——wb
Largest db temperature differential permissible for room to be conditioned ——°F; coil SHR = TSHL/TCL†† = * O.——

$$\text{Cfm through coil} = \frac{\text{total sensible heat load}}{1.08 \times (\text{ent. db—lvg db})} = \frac{\text{Btu/hr}}{1.08 \times {}^\circ\text{F}} =$$

*————cfm
Air mixture entering coil: *—— db; *—— wb; —— Btu/lb dry air
Air mixture leaving coil: *—— db; *—— wb; —— Btu/lb dry air
The wb temp. and the heat content of the leaving air must be determined now:
Diff. between heat content of entering and leaving air is equal to

$$\frac{\text{Total cooling load on coil}}{\text{Total cfm through coil} \times 4.45} = \frac{\text{Btu/hr}}{\text{cfm} \times 4.45} = \text{——Btu/lb}$$

Heat content of entering air at——°F wb = ——Btu/lb dry air
Diff. between h.c. of ent. and lvg air = ————Btu/lb dry air
Heat content of leaving air = ——Btu/lb dry air
Wet bulb temp. of leaving air is therefore = ——°F
Equipment vendor selected for design purposes ————
Model No. ————; rows deep *————; fin spacing ————; suction temp. *————°F
Face area ——sq ft; max. face velocity allowable *————fpm
No. coils required *——; No. high *——; No. wide *——; No. circuits *——
Tube length *————; tube face ———— and ————; spray pump P- *————
Overall dimensions: length ————inches; width ————inches; depth ————inches; optg wt ————lb
Piping connections: supply ————ips; return ————ips
Air friction (coil wet): *————inches w.g.; eliminator friction: *————inches w.g.
Water pressure drop: *————ft; ent. water temp. *————°F; lvg water temp. *————°F

$$\text{Gpm through coil} = \frac{\text{Total cooling load on coil (Btu/hr)}}{500 \times (\text{lvg water temp.—ent. water temp.})} = \frac{\text{*Btu/hr}}{500 \times {}^\circ\text{F}} = \text{————gpm}$$

Factor ( )†:————; factor ( ):————; actual water velocity ————fps
Factor ( ):——; larger temp. diff.——; smaller temp. diff. ——; MED——°F
Equipment vendor (equal) ————
Equipment vendor (equal) ————
Type of automatic controls connected to cooling coil valve *————
Other accessories ————

†Factors () can refer to the equipment vendor's cooling coil selection factors.
††SHR = sensible heat ratio. TSHL = total sensible heat load. TCL = total cooling load. MED = Mean effective temperature difference.

Modernization of the 1919 heating system of the John R. Pruett residence in Swarthmore, Pa., included replacement of cast iron radiators by Warren Webster & Co. baseboard heating.

(Above) A 1919 baseboard was a 3-inch steam pipe with cast iron openwork cover designed by Mrs. Pruett's architect father, Oliver Duke.

(Left) For auxiliary heating, grating of a pipeless furnace was fitted in the Pruett stairway and equipped with Webster finned radiation.

(Below) Sections of Webster wall convector warm the Pruett plant conservatory.

Picture Paragraphs

(Below) Eight tons of tank, 45 ft long and 10 ft in diameter, being installed on concrete cradles by H. Lieblich & Co., New York heating and plumbing contractors, to provide half of 50,000 gallon fuel oil storage capacity at an apartment housing project.

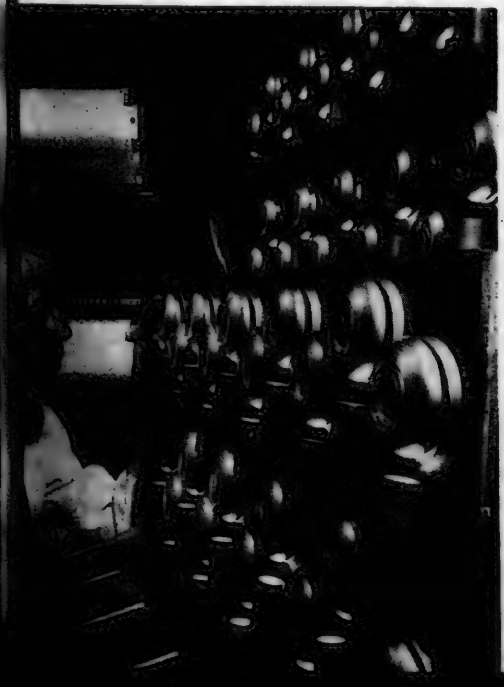
(Below) Geyser of icy calcium chloride brine rises as big steel tank, frozen at -45F, bursts in rupture test at 2850 psi. Steel is new type developed by U. S. Steel Corp.

(Above) World's largest thermos bottle is this huge steel sphere used by the Knolls Atomic Power Laboratory to test a prototype of an atomic submarine. Insul-Mastic coats the bare metal, followed by foamglass block, a mastic tack coat, a glass cloth membrane, and a final coat of mastic.

(Above) This youthful advocate of car air conditioning and his mother are taking an imaginary ride in this special cutaway auto at Steel Pier, Atlantic City, but there is nothing imaginary about the cooling. The chassis is equipped with an operating Frigidaire air conditioning system, powered by a real engine under the hood. It is a popular rendezvous for visitors at the GM exhibit on the pier during hot days.

(Right) The new home of the Vapor Heating Corporation, with its attractive main entrance that resembles a giant TV screen, is built of brick and steel-reinforced concrete, is one story high and contains approximately 220,000 square feet of factory and office space.

(Below) With the aid of miniature furnaces, thimble-size light bulbs housed in plastic tubes, technicians at Minneapolis-Honeywell subject the company's new round thermostats to various heat conditions equivalent to a lifetime of use.



(Below) A pretty Philadelphia Miss demonstrates one of the take-apart control panels in the new General Electric Heating Controlmobile, a traveling service school launched by the company's Appliance Control Department. Completely housed in a custom-built air conditioned trailer, the school begins a nationwide tour this month with first showings in the New England area.

Air Conditioning an Operating Hotel

GARDNER SAVAGE

Berington, Taggart and Fowler, Inc.,
Consulting Engineers, Indianapolis, Ind.

Ducts run outside top floors to bypass dining and ballroom areas.

Lack of room for ducts and apparatus is usually a serious problem when air conditioning an existing building. The Lincoln Hotel in Indianapolis was no exception. In fact, certain conditions made ordinary design problems seem simple by comparison. The story of how it was air conditioned may serve as an example to engineers with similar problems.

THE Lincoln Hotel in Indianapolis was built in 1917-18. It is a flatiron shaped, fifteen story, four hundred room structure with an average floor-to-ceiling height of 9½ ft. All guest rooms are with bath, and the majority follow the standard hotel plan of an entrance hallway into the guest room with the bath on one side of the hallway and the closet on the other side. The basement is completely filled with kitchen and other utilities. The street floor is made up of lobby, coffee shop, and a number of leased shops. The top floor is completely occupied by the ballroom and several dining rooms.

In 1952 the management decided that the time had arrived when air conditioning should be considered. Humidity control and cooling were the only requirements since the existing heating system was in excellent condition and would serve well for winter heating.

Desirable Features Studied

Approach to the problem was conventional. Criteria that the final design would have to meet would be applicable to almost any existing multiple room, multiple occupancy building, hotel or office. They were:

(1) Economy of installation.
(2) Minimum building alterations.
(3) Minimum loss of revenue.
(4) Individual room control.
(5) Draftless air distribution.
(6) Quiet operation.
(7) Ease of maintenance.

Conventional Methods Considered

Each of the following conventional methods of air conditioning was carefully considered. Each was finally ruled out as not being feasible for the Lincoln.

(1) While a conventional, low pressure, central system would have had many advantages, only preliminary calculations were necessary to show the impracticality of this scheme. Corridors were too low to permit installing conventional ducts above new false ceilings, and there were absolutely no places where the relatively large vertical ducts could be run.

(2) Fan rooms on each of the guest room floors would eliminate the need for large vertical ducts but did not avoid the necessity of furring down corridor ceilings to an objectionably low level. Moreover, to provide space for these fan rooms would have required that the hotel give up one guest room on each floor.

(3) Individual room units, supplied with chilled water from a central refrigerating system, appeared to present a reasonable solution, but had some disadvantages. The Lincoln, being one of the earlier reinforced concrete structures, had extremely wide beams at each exterior wall. These beams, our calculations showed, could not be safely core drilled for the necessary water and drain pipes. It would, therefore, be impossible to place the units on an outside wall where outdoor air connections could be reasonably made. Further, it was decided that cutting the wall for such outdoor air connections would be expensive as well as unattractive from the outside.

(4) Self contained window units could have been installed with no greater difficulty than providing new electrical service to each room. These were rejected for two reasons. First, the hotel management felt that the projecting room units would detract from the appearance of the building. Second, maintenance would be increased because of the number of units required.

High Velocity, High Pressure Distribution

Of the four conventional methods considered, the central station system appeared to hold the most promise if duct sizes could be reduced by increasing air velocities far above conventional practice and if some satisfactory method of absorbing the air noise could be found. Air quantities could be reduced somewhat by greater temperature differentials if air distribution were carefully con-

trolled. Individual room temperature control could, somehow, be provided. Several high velocity, high pressure, installations in other cities were inspected. While none of these were installed in hotel guest rooms, designers were convinced that such an installation could be satisfactory.

Only a slight modification of the standard high pressure diffuser made by Connor Engineering Corp. was necessary to permit the use of a small, remote, manual controller to be used so each occupant could adjust the quantity of air to suit his own taste.

The problem of running ducts, or conduit, to bring the air to the rooms was solved by reducing the air temperature to 58F, and by increasing its velocity to more than 3000 fpm, it was found that the main supply risers could be reduced sufficiently to be installed within the building on all guest room floors. A few inches were taken from the end of a corridor for the supply riser for one zone, the other supply riser was furred into the elevator lobby by appropriating the space formerly occupied by some ornamental niches. The relatively small size of these main risers permitted bypassing the dining rooms on the top floor by simply turning the ducts out through the wall and running them outside of the building to the fan equipment on the roof. The branch ducts on each floor were proportionately reduced in size, to about one third of conventional, and were easily concealed above a new ceiling. In fact, the small size of these branch ducts made it possible to drop under deep beams that would have completely stopped the conventional low pressure duct.

Equipment Installation

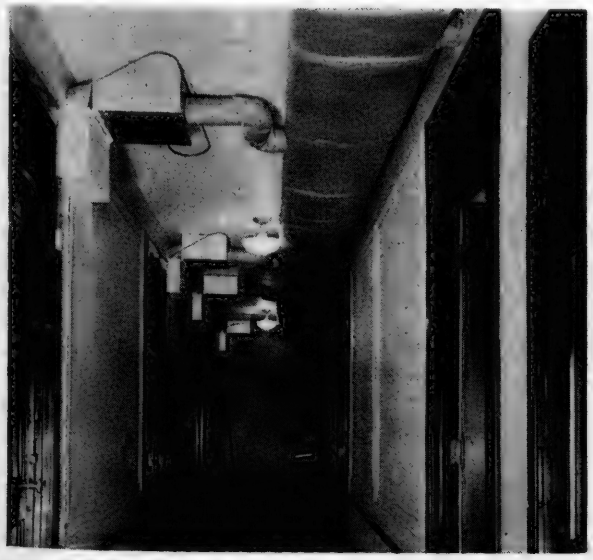
Our original scheme included the use of a two story penthouse, the first floor accommodating the refrigerating equipment and the second floor housing the air handling equipment. Direct expansion cooling coils could then be used because of the short distance from condensing units. However, a structural investigation showed that the column footings could not be safely loaded to the extent necessary to carry this equipment. The final design found the refrigerating equipment located in the basement and chilled water pumped to water cooling coils in the penthouse.

The refrigerating equipment consists of four 50-hp York reciprocating compressors handling Freon-12 at 40F suction and 105F condensing temperatures. Each machine is provided with unloaders permitting 50% capacity reduction. Two double circuit Acme chillers are used so the refrigerent circuit for each condensing unit is completely independent of all others. This arrangement avoids the oil return problems often encountered with multiple units and is especially advantageous from the service angle. Even though one system is down for maintenance or repair three quarters of the total system capacity is available.

Condenser water is cooled by two 100-ton forced draft cooling towers located on the low roof of an adjacent building. Here again structural considerations affected the tower selection. Instead of a single, conventional, induced draft tower located on the high roof of the hotel two smaller towers were selected. Because these had to be located in a court area, noise and drift were given very careful consideration. Finally, two Binks towers, having centrifugal blowers were selected.

The guest room section of the hotel is divided into two zones, each of which can be operated independently. Each system has its own fan, 8-row water cooling coils, dust filters, and activated carbon air purifiers. Each fan discharge is provided with a muffler 20 ft in length and constructed of 2-inch thick sound absorbent glass fibre protected from erosion by perforated metal.

The two main supply ducts, running from the penthouse to the edge of the roof, drop over the parapet and descend on the outside of the building to the 13th floor ceiling level. At this point the supply ducts enter the building and continue downward, inside, to the second floor ceiling. Take-offs for the branch mains on each floor are made at the ceiling. At the roof, and above the first take-off, the main velocity is approximately 400 fpm. Since the main risers are constant in size this velocity decreases at each branch take-off. In this manner some static pressure regain



High velocity ducts in hallways are small enough to permit covering by new ceiling.

New ceilings in hallways cover ducts. New lighting improves appearance.

Diffuser grille in room ready for enclosure.

Room outlet and enclosure in place.

is accomplished to compensate for duct friction losses. Velocities in the branch ducts serving each floor will approximate 3000 fpm at the junction with the main risers but decrease continuously as take-offs are made for each room.

The individual room take-offs from the corridor branch ducts are made at velocities varying between 2000 and 2600 fpm. Each such take-off connects to a high pressure grille unit wihch reduces the air pressure and velocity to conventional levels so it can be handled by a double deflection grille. A low pressure duct connects the pressure reducing unit to the grille which is located on the inside wall of the room, blowing toward the window, a distance of ten to twelve feet. Maximum air deliveries vary between 100 and 320 cfm depending upon the room size and exposures. Specially selected grilles are used, their dimensions depending upon throw and air volume desired.

Since the inherent stability of a high pressure system makes temperature control by means of volume adjustment feasible, each room is provided with a manual air volume controller. This air volume control, usually located at the room entrance, is connected to the high pressure damper by means of a flexible cable. Turning the adjustment knob varies the quantity of air handled from the selected maximum to a complete shut-off. This enables each guest to dial the room temperature best suited to his needs.

Air from each guest room is exhausted through the bath rooms and up pipe shafts to exhaust blowers on the top floor. Since the bath rooms in connection with hotel guest rooms are used for only a very small part of the occupancy period it was decided that the air being exhausted through these rooms could be properly purified and reused to accomplish a very appreciable saving in equipment and operating cost. Accordingly, duct connections were made between the exhaust plenums and the air conditioning equipment to permit supplementing outdoor air with purified exhaust air. Automatic dampers control the mixing of this air in proportions selected. A fixed minimum of outdoor air is always introduced to keep the air conditioned space slightly pressurized.

The main ballroom and dining rooms on the top floor are served by small conventional systems using standard air handling units and low pressure duct systems. All systems receive chilled water from the common refrigerating equipment. The main ballroom system is of interest because the air flow was reversed over the original installations. This room originally had ventilation air supplied by underfloor ducts terminating in radator recesses. Upon installation of the air conditioning system these ducts were used for returns, a new supply duct was installed over the ceiling, and air supplied to the room through high pressure ceiling diffusers.

One of the great advantages of the high pressure system, as applied to the Lincoln Hotel, was the small amount of building alteration required by the ducts and equipment installed in the occupied areas. Outside walls were penetrated only once for each main supply duct. Floors were cut for each of two main supply risers. Each room take-off required only a small hole above the door. New ceilings were installed in the corridors below the branch ducts and take-offs, and, at the same time new lighting was installed so the appearance of the corridors was actually modernized and improved. A small amount of new ceiling was installed in each guest room to conceal the air unit and the two main risers were furred in.

The system was started up in the summer of 1953 and all concerned have been pleased with its performance. Air distribution within the rooms is draftless and the noise level even lower than that anticipated. The high pressure room units are specially designed with sound absorbent baffles so that the maximum noise level emitted by the system is 40 decibels. At most locations a level of 38 decibels has been measured. Where noise is at all perceptible, it is of such nature that it is not unpleasant in character.

So satisfactory have been the results obtained with this system that two more high pressure systems have been designed by our firm; a telephone exchange building where the small high pressure ducts permit greater space for the owners' equipment, and a bank and office building where the use of high pressure ducts permitted reduction of the building height by one full story.

Axial Thrust in Centrifugal Pumps

IGOR J. KARASSIK and ROY CARTER

Centrifugal Pump Division, Worthington Corp., Harrison, N. J.

Axial thrust, the sum of unbalanced forces acting on a centrifugal pump impeller, is analyzed in this article, fourth in a series, and means of counteracting thrust are illustrated

AXIAL hydraulic thrust is the summation of unbalanced forces on an impeller acting in the axial direction. An ordinary single-suction radial-flow impeller, with the shaft passing through the impeller eye, is subject to an axial thrust because it exposes more back wall surface to the discharge pressure than the opposed front wall, a portion of the front wall being expose to the suction pressure. If it were assumed that the pressure in the discharge chamber is uniform over the entire area of the impeller, the axial force acting towards the suction of the impeller would be equivalent to the product of the net pressure generated by the impeller and of the unbalanced annular area. In contrast, a double suction impeller is theoretically in axial balance, as illustrated by Fig. 1.

This axial balance of double suction impellers is based on the assumption that the liquid enters the impeller in equal volume from both sides. Practically, however, a double suction impeller may still develop an unbalanced axial thrust, for a variety of reasons. Therefore, all centrifugal pumps, even when built with double suction impellers, are provided with thrust bearings.

Actually, the pressure acting on the two walls of a single suction impeller is not uniform over the entire area exposed to the discharge pressure. This lack of uniformity is due to the fact that the liquid trapped between the impeller shrouds and the casing walls is in rotation and the pressure acting at the periphery of the impeller is appreciably higher than the pressure at the impeller hub, as shown in Fig. 2. Therefore the axial thrust acting towards the suction of the impeller is somewhat less than the net pressure times the unbalanced area. As an approximation, it can be said that this thrust may range from 70 to 80% of the value which would be based on the assumption of a uniform pressure distribution.

In order to eliminate the axial thrust of a single suction impeller, it is possible to provide it with wearing rings both in front and in back, the inner diameter of both rings being made the same so as to equalize the thrust areas, as shown in Fig. 3. The pressure in the chamber located inwardly of the back wearing ring is maintained substantially equal to the suction pressure by so-called balancing holes through the impeller. The leakage past the back wearing ring is returned into the suction area through these balancing holes.

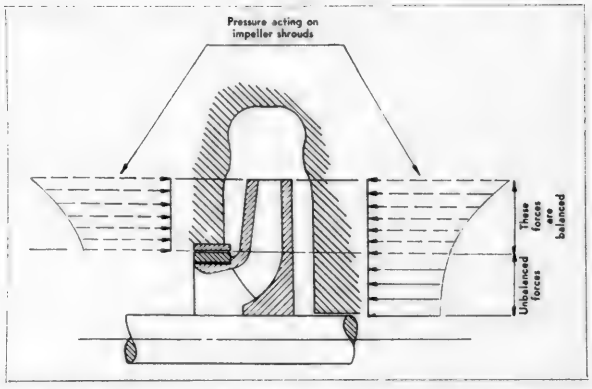


Fig. 2. Actual pressure distribution on front and back shrouds of single suction impeller with shaft passing through impeller eye.

Another method used to eliminate or reduce the axial thrust of single suction impellers is the provision of pump-out vanes on the back shroud of the impeller. The effect of these vanes is to reduce the pressure acting on the back shroud of the impeller. (Fig. 4) Such a construction, however, is mostly limited to pumps handling gritty liquids, where it serves the primary purpose of keeping the clearance between the impeller back shroud and the casing free of foreign matter.

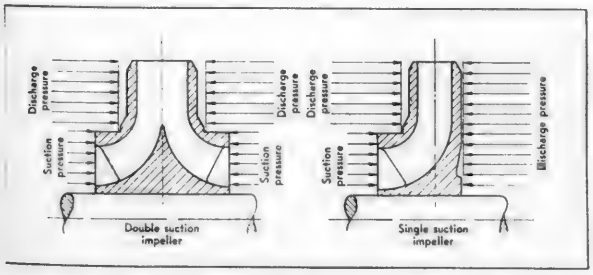


Fig. 1. Comparison of double suction and single suction impellers with reference to origin of axial thrust.

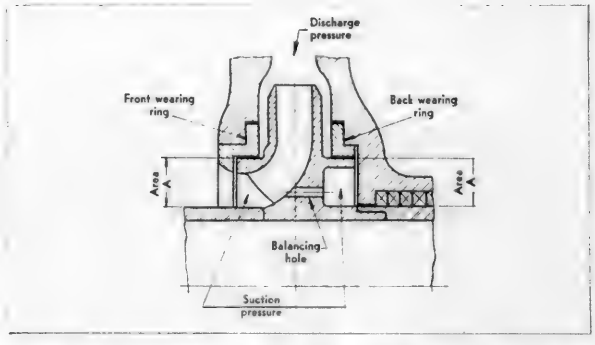


Fig. 3. Balancing axial thrust of single suction impeller by means of wearing ring at the back and balancing holes.

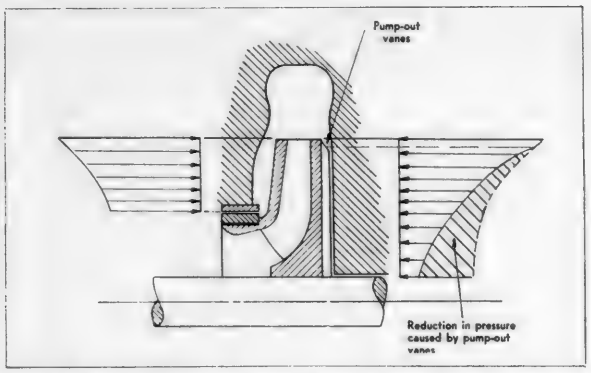


Fig. 4. Balancing axial thrust of single suction impeller by means of pump-out vanes on the back shroud.

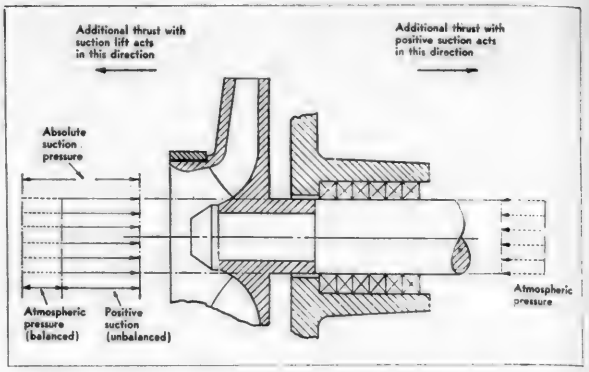

Additional thrust with suction lift acts in this direction
Additional thrust with positive suction acts in this direction
Absolute suction pressure
Atmospheric pressure (balanced)
Positive suction (unbalanced)
Atmospheric pressure

Fig. 5. Single suction overhung impeller type pump with single stuffing box.

So far, the discussion of the axial thrust has considered single suction impellers where the shaft passes through the impeller eye and where the pump is provided with two stuffing boxes, located on both sides of the impeller. In such a case, the magnitude of the suction pressure does not affect the resulting axial thrust. On the other hand, the axial forces acting on an overhung type impeller with a single stuffing box (as in Fig. 5) are definitely affected by the suction pressure. This is due to the fact that, in addition to the unbalanced force illustrated in Fig. 2, there is an axial force equivalent to the product of the cross-sectional area of the shaft through the stuffing box and of the difference between the suction pressure and the atmospheric pressure. This force, therefore, may act either towards the impeller suction, when the suction pressure is less than atmospheric or in the opposite direction when it is higher than atmospheric.

The magnitude of this force when the pump handles a suction lift is very low. For instance, if the shaft diameter through the stuffing box is 2 inches (area-3.14 sq inches) and if the suction lift is equivalent to 20 feet of water (absolute pressure-6.06 psi), the axial force due to the use of the overhung impeller and acting towards the suction will be only 27 lbs., very little indeed. If the suction pressure is 100 psig, the force will act in the opposite direction and will be 314 lb. It is obvious, therefore, that since the same pump may be applied to a variety of conditions of service over a wide range of suction pressures, the thrust bearing of single suction overhung impellers must be generally arranged to take thrust in either direction and must be selected with a thrust capacity sufficient to counteract forces set up under the maximum suction conditions which have been established as the maximum limit for the particular pump in question.

In addition to radial flow impellers, mixed flow and axial flow impellers are commonly used. Except for very large sizes and certain special applications, the maximum thrust which may be developed by such impellers is not of great importance since the operating heads are relatively low.

In the case of axial flow impellers, there is an axial thrust caused by the pressure imposed on the vanes as they act on the water. In addition, there is a difference in pressure acting on the two ends of the shaft hub, one end being subject to discharge pressure and the other to suction pressure. Occasionally, provision is made in an axial flow pump for a leakage joint at or near the periphery of the discharge hub, with balancing holes through the hub. This construction is used mainly in vertical wet pit pumps with covered shaft designs, in order that the seal at the lower end of the cover pipe be subjected to suction pressure rather than to discharge pressure.

In the case of mixed flow impellers, the axial thrust is a combination of the forces caused by action of the vanes on the water and of the forces arising from the difference in the pressures acting on the various surfaces. It is very common practice to provide wearing rings on the back side of mixed flow impellers and either balancing

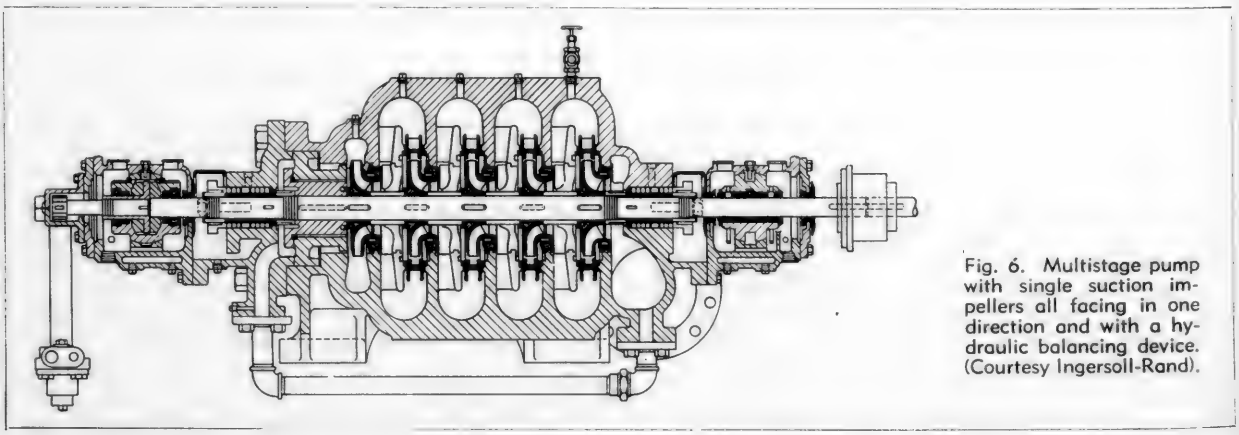


Fig. 6. Multistage pump with single suction impellers all facing in one direction and with a hydraulic balancing device. (Courtesy Ingersoll-Rand).

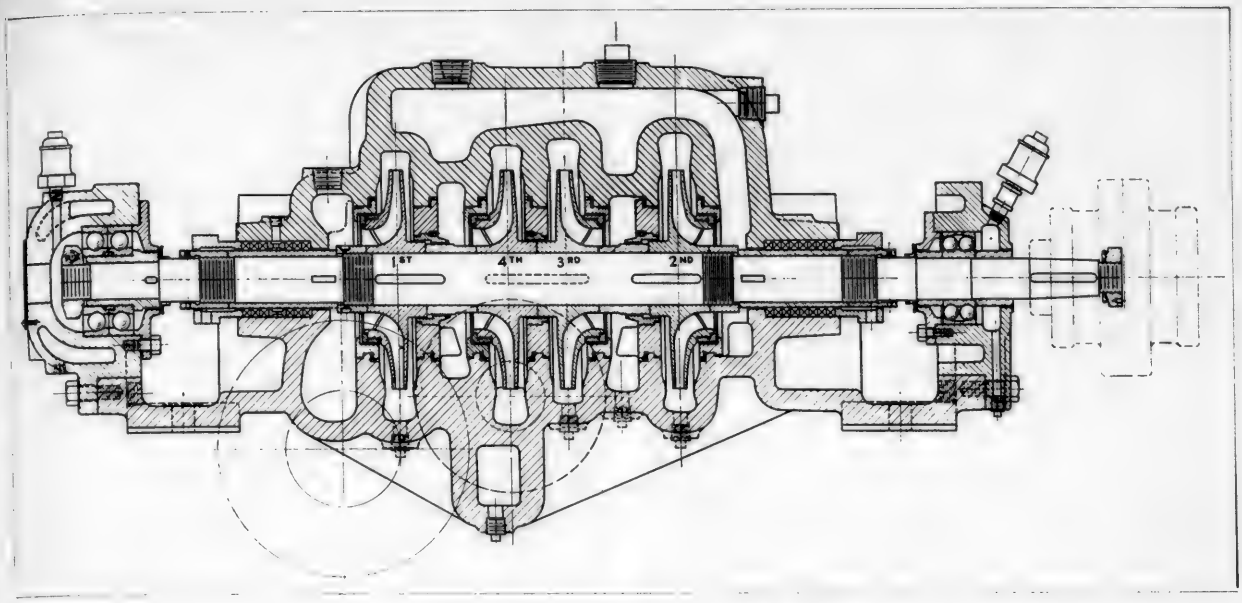


Fig. 7. Four stage, opposed impeller pump.

holes through the impeller hub or an external balancing pipe leading back to the suction.

Multistage Pumps

The average multi-stage pump is of relatively low capacity when compared to the entire range covered by modern centrifugal pumps. As a result, it is seldom necessary to use double suction impellers for the sole purpose of reducing the net positive suction head required for a given capacity. In addition, the use of double suction impellers requires additional space for the extra passage leading to the second inlet of each successive stage and, in the case of a pump with four or more stages, this increase in shaft span becomes quite appreciable, to say nothing of the added casting difficulties.

As a result of these considerations, the majority of multi-stage centrifugal pumps are built with single suction impellers.

There are two arrangements of single-suction impellers for a multistage pump:

(1) Several single suction impellers may be mounted on one shaft, each of these impellers having its suction inlet facing in the same direction, the stages following each other in the ascending order of pressure (Fig. 6). The axial thrust is then balanced by a hydraulic balancing device.

(2) An even number of single suction impellers can be mounted on one shaft, half of the impellers facing in a direction opposite to the second half, so that the axial thrust in one direction on half of the impellers is compensated by the thrust in the opposite direction acting on the second half, (Fig. 7). This mounting of single suction impellers back to back is frequently referred to as "opposed impellers."

This last arrangement can be changed to use an uneven number of single suction impellers, provided the resulting axial unbalance is taken care of by the proper choice of shaft and interstage bushing diameters, so as to give effect of a hydraulic balancing device to compensate the hydraulic thrust of one of the stages.

Next month—shafts and shaft sleeves

Snow Melting on Apartment Terraces

Snow melting coils embedded in outside corridors of new Roosevelt Terrace Apartments, Jackson Heights, New York, permit a radical departure from the traditional design features of large multi-story residences, while effecting considerable savings in building costs and future maintenance expense. Hidden heat keeps the outside corridors free of ice and snow in winter weather and makes them practical for year-around use as the main artery leading from the living suites to the elevator and stairway areas. There are no long, dingy interior hallways to block out light.

Because the Roosevelt Terrace Apartments are built for private ownership in a cooperative corporation, the full utilization of building area and absence of hall carpeting and cleaning expense represent important economies to purchasers.

The snow melting systems serve corridors of all nine floors of each apartment. With three corridors to a floor, there are 27 coils in each building. In the four buildings, a total of 108 snow melting coils serve as many outside corridors.

The piping networks, comprised of $\frac{3}{4}$ inch wrought iron pipe, are connected to supply lines leading from the main boiler room in one of the buildings to individual heat exchangers in each building. Heated water mixed with anti-freeze is circulated through the piping.

(Left) Temperatures in open hearth furnace area reduced by Hy-V Air Jet fans made by DeBothezat Fans Division, American Machine and Metals, Inc. (Right) Jet fan turned on cold reduction mill to cool operating personnel.

Air Jets Control Heat

For cooling hot spots in industry, powerful fans with large nozzle outlets can project air up to 60 ft, thus can be set back away from hot area and used to cool exposed personnel or equipment.

THERE are bound to be high temperature spots in any mill that produces steel sheets, tin plate, wire, nails, cables and many other steel products. And the Columbia-Geneva Steel Division of U. S. Steel Corp. is no exception. In the open hearth area, for instance, molten steel reaches a temperature of nearly 2900F. Then, considering that this mill is located in a part of California where outdoor temperatures reach 100F, Columbia-Geneva's management anticipated the need for keeping workmen comfortable and have accomplished this purpose by means of spot cooling.

Six years ago, Columbia-Geneva tried out a new type of fan which delivers a concentrated stream of air at high velocity and projects it up to 60 feet without ducts. Fan wheels are of 24-inch diameter and operate at 1800 rpm. A nozzle velocity of 4940 fpm is developed by 3-hp motors. The fan can pin-point cooling air on a workman, on a piece of equipment or on a product being manufactured. Since the initial trial, Columbia-Geneva has put 40 of these fans to work cooling various spots in the plant.

The fans are turned on workers who are making bottom in the open hearth furnace and who draw samples of steel for test. Their breezes reach the area in front of the furnace where workers face the heat of open furnace doors. Other fans are used in the area behind the furnaces where workmen guide the molten steel into the ladles. With fans providing cooling air, the men are able to accomplish their work with maximum efficiency.

In addition, jet fans are used to cool hot spots which develop on the roofs of open hearth furnaces in this area. This prolongs the life of the roof.

Reduce Down-Time

From time to time, brick furance checkers must be replaced or the checker-work rebuilt. The checkers of course have to be cooled before these repairs can be made. In the days prior to the use of jet fans, natural cooling required several days. This put the furnaces out of use for long periods of time. But now when repairs are in order, jet fans cool the checkers much more quickly with a great saving in down-time.

For equipment cooling, portability of the fan is an important factor. It is mounted on a wheeled stand and can be rapidly moved from furnace to furnace, or wherever else needed in the mill. This mobility also means that a minimum number of units are required. For permanent installation, fan units are furnished with a bracket for mounting on a wall or column.

LONDON LETTER

Commentary on developments in Europe by our correspondent in Great Britain

WONDERS never cease! Meat is now off the ration and British housewives can buy more than 25 cents worth a week (if they can afford it); dairy cream has appeared in time for those raspberries the bees were busy at two months ago, and it's actually being *advertised* with instructions for use by householders too young to remember the taste for 15 years; and natural gas was discovered on June 23 at a depth of 831 feet only 20 miles from this typewriter as the crow flies, at Crowborough in Sussex.

Natural Gas

This is the first such discovery in Britain, though firedamp in coal mines and marsh gas have been with us for centuries. Things that are "damp" are so generally unburnable that it is strange to find two almost opposite meanings both derived from an old word meaning "vapor." In Germany the word (dampf) now usually means steam. The word "gas" suffers the disadvantage of being too easy to say. The verb means to emit hot air, if used of inveterate talkers. To the scientist a gas is distinguished from a liquid or a solid, and air is a gas or at any rate a gaseous mixture. For the heating engineer it must at least be combustible and have some calorific value to merit the name, unless he is dealing with flue gas. To the reader with an automobile it means a liquid to put in the tank, which would have been very confusing over here ten years ago when laundry vans plied the streets with gas bags on top, buses towed gas-producers behind them, and Croydon's garbage trucks had natural gas liquefied at minus 266F in their tanks.

But this was a natural gas from a different source, though still the same stuff, methane. The average human being obligingly supplies his sewage disposal works with between 1 and 2 cu ft of methane a day, which is enough to pump his bathwater through the treatment plant, operate the air blowers, and heat the offices. The conurbation of London now makes such demands upon the River Thames that this is reduced to a mere trickle of a few million gallons an hour in a dry summer, the water which is taken out being put back in a less pure condition and in a quantity which exceeds the fresh water flow by a factor of 3 or more. The London County Council have now decided to treat part of the effluent they pour in so that visitors to London by sea will not have to breathe sulphuretted hydrogen on the way. This will be a sewage treatment operation on a vast scale, and several gas turbines have been ordered to be powered by the natural gas from the sludge digestion tanks.

Natural gas from subterranean sources, however, is expected to be found in sufficient quantity to repay the cost of exploitation, but not to affect the pattern of fuel use in this country.

Nationalized Competition

This pattern, as far as gas is concerned, has developed from small gas works producing gas from coal to supply to domestic users. Until quite recently there was at least one one-man gasworks in the country; he shovelled the coal, checked the calorific value, went round meter-reading, and made out the bills. A few years back, the domestic gas industry was hard hit by the spread of electricity and fought a series of rearguard actions, even to producing a radio set worked by gas! The most successful of these efforts was perhaps an arrangement for gas companies to have exclusive rights in the type of refrigerator that works on the ammonia-hydrogen partial-pressure cycle. Your correspondent picked up the last of these in a big London store in 1942 when production ceased, and has since had to clean burner and flue at least twice. Maintenance on this scale will probably be unnecessary with the electrically heated units which are now available.

Gas still holds its own in unexpected situations, for example lighting on the stations of electrified railroads. But it was mainly the stimulation of substantial industrial uses for gas that saved the industry. Therm for therm it is generally cheaper than electricity for any heating job. This applies much more to large industrial or commercial users than to domestic consumers, because of the way the tariffs are affected by the peak load problem. In this part of the country electricity has risen steeply in price recently and an extra therm for domestic purposes costs 28 pence as against 20 pence for a therm of gas, the latter not being usable (for water heating, say) with 100% efficiency.

With gas and electricity supply in different hands, albeit both nationalised, there is more than enough competition to satisfy General Sherman. Some people regret the passing of a situation in which technical integration of fuel services on an area basis could have flourished. For example, Birmingham Corporation, supplying both gas and electricity, needed low-pressure steam for the retorts in the gasworks, produced it at high pressure and generated electricity from it. If there were unified Service Corporations the builder of a factory or a block of flats could presumably get unbiased advice from one sales engineer, whereas now he has to sort out for himself the contradictory claims of solid fuel, oil, gas and electricity. Oil supply is not nationalised, but its protagonists are none the less pushing.

On the production side the gas industry is keeping costs down partly by concentrating in new larger works.

Going back to sewage disposal for a moment, this raises some tricky problems because town sewage can deal with a small admixture of gasworks effluent quite satisfactorily. It is difficult to treat the stuff on its own, and a large gasworks sited out of town is an entirely different proposition.

The manufacture of appliances is still, of course, mainly in private hands, although distribution and service is largely via the local showrooms of the Gas Board. In this field the gas engineers have really got together with the heating and ventilating engineers in the interests of indoor comfort. A big step forward was possible once it was admitted that buildings will have electricity anyway and it was therefore not giving away a point to make use of it. For instance a system of Whole House Warming has been installed in a new block of flats at Richmond, Surrey. Gas-fired air heaters, with the air circulated by electrically-driven fans, have been built unobtrusively into the premises.

The heaters are thermostatically controlled and operate without attention. Full safety protection is included. An internal thermostat turns off the gas in the event of any danger of over-heating from failure of the fan or any other reason, while a thermo-electric flame-failure device automatically prevents the main gas valve from opening should the pilot light fail. The only adjustment called for from the occupant is to reduce the thermostat setting at night to save fuel, and to restore it on rising; warm air is ducted to all parts of the house and the bedroom temperatures can be raised 10F in as many minutes.

A heater requires a floor space of 18 inches by 20 inches for 40,000 Btu per hr rated output, and in the application referred to has been tucked away in the partition structure between the bedroom and the bathroom. An overall efficiency of 75% is claimed which, on the prices quoted above, still gives a slight advantage over electricity, bearing in mind the need for ventilation. Air-conditioning in homes is hardly necessary in the summers we are used to, but leaving the fan running in such an appliance give a welcome air movement in hot weather.

Fig. 1 shows a room gas heater that is designed to give a certain amount of air warming combined with a high proportion of radiant heat, in line with modern ideas that walls and furniture rather warmer than the air are best for comfort. This is a condition that the much abused open coal fire, despite its drafts and smoke, cannot help creating. This new design is a long way from the old gas fire with its noisy aerated flames and ceramic radiators. It incorporates luminous flame burners which are quiet in operation, and instead of the taper held at arm's length and the loud explosion that so often accompanied the lighting of a gas fire years ago the gas tap embodies a flint lighter. Turning the tap full on automatically lights the fire.

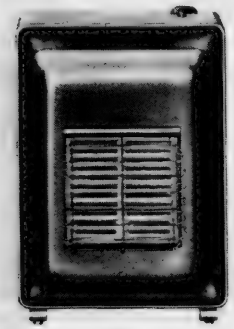


Fig. 1. Gas room heater made by Radiation Ltd., London

An interesting and simple device noted in a hotel bedroom a few months ago was a free-standing gas ring surmounted by a perforated pyramid. Within a minute or two after lighting the gas the pyramid was glowing red-hot and pleasantly radiating in all directions.

Fig. 2. Gas radiant heaters warm passers-by in front of the Northern Gas Board showrooms in Newcastle.

Snow Melting by Gas

As noted in the May issue of *The Industrial Heating Engineer* experiments are in progress in this country on outdoor radiant heating by gas. Since the war, Schwank Gasgerate GmbH of Cologne have developed a heating unit using porous refractory plates of low thermal conductivity and employing natural draft injectors; the units only require connection to the gas supply. Although the idea was mooted many years ago the need of the earlier designs for a boosted air supply in addition was considered to be a disadvantage that hampered development.

The Northern Gas Board has installed over the sidewalk outside its showrooms in Newcastle a number of such units made by the Harris Engineering Co., the British licensees, as shown in Fig. 2. They are suspended at a height of 10 to 12 ft in groups of 2 or 3 units. It is considered that heaters consisting of at least three units, each unit consuming 13,000 Btu per hr, are necessary for this application. The total frontage is 70 ft and for this it is suggested that four such heaters would be sufficient, at least for the climate of Newcastle. This would not provide uniform heating, but four "pools of warmth" which would be strategically arranged by a department store owner in relation to his window display.

There is no doubt of the effectiveness of such installations in arresting attention. Your correspondent was progressing along the sidewalk in question one chilly day earlier this year with no thought other than making

(*Continued on page* 156)

Louis Blendermann on

PIPING and PLUMBING

Access Space for Plumbing Fixtures

OVER the past number of years, architects and engineers have shown an increasing tendency to provide an access space behind or between rows of plumbing fixtures. Basically, an access space is a narrow corridor behind a single row of fixtures or between a double row of fixtures through which a man may pass for inspection and maintenance purposes. Acceptance of access space in design work, even though it uses up some floor area, is understandable because of the ease that this arrangement provides for inspection and maintenance, and the better appearance that results in toilet rooms when all valves are moved back of the fixture-supporting wall, into the access space.

In certain institutions, as prisons or mental hospitals, the access space often ceases to be optional and becomes a necessity because of the requirement that fixture trim of any type or form must be concealed to prevent inmates from inflicting injury upon themselves with such trim.

Access spaces are widely used in various types of buildings and they are particularly desirable because it is possible to use push button or oscillating handle controls in the toilet rooms and to conceal the flush valves. Since the flush valves, valves, and all piping are installed in the access space, and only the fixtures are exposed in the toilet room, a high standard of sanitary conditions can be achieved.

The decision of whether or not an access space should be provided, depends on the desires of the owner or the architect, the particular nature of the building, and the proposed location of the toilet rooms. If numerous fixtures are required in the toilet rooms, the access space would be a definite advantage.

As floor area is an important item to both the architect and the owner, a major consideration is the amount of floor area required for the access space. In this article, we will consider just two conditions—the minimum size of an access space for a single battery of fixtures and the minimum size access space for a double battery of fixtures that are back to back, together with certain considerations relating to the piping installed in these spaces.

Single Battery of Fixtures

As an example for a single battery of fixtures, we shall assume one consisting of water closets, urinals and lavatories as would be found in a men's toilet room. Fig. 1 is a typical arrangement of such a condition.

In Fig. 1, only the water closets have been indicated since such roughing dimensions determine the required extra space needed for access. All piping, including soil, waste, vent and water piping, is installed as close as possible to the wall on which the fixtures are supported. The 2 ft access width is minimum and yet will allow a man to move through the space for maintenance and repair purposes. Since the flush valves are also located in the pipe space, they can be inspected and adjusted with ease.

Conventional fittings were used in Fig. 1 to show the overall piping dimensions. Patented closet fittings of various types could be used to better advantage than the fittings shown because they are more compact. But in this example, the conventional type fittings were used to illustrate the condition.

Entrance to this back-wall space is provided by an access door placed at one end of the space or in the wall, not supporting the fixtures. The architect normally chooses the door location.

Double Battery of Fixtures

As an example of a double battery of fixtures, we shall assume two batteries of fixtures, back to back. One battery has the water closets, urinals and lavatories as are

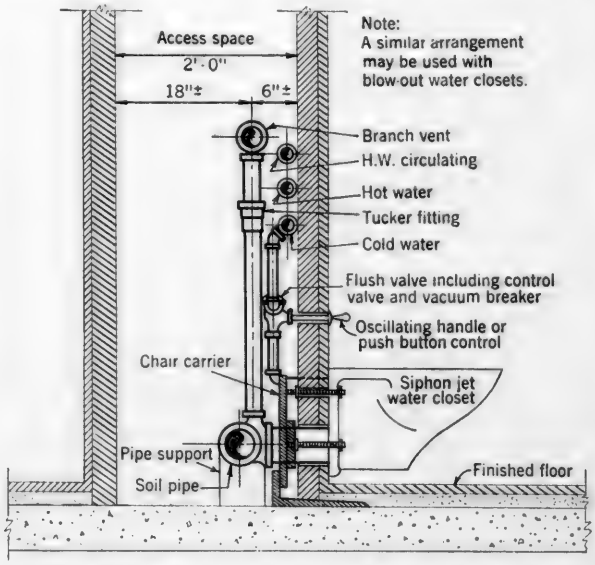


Fig. 1. Access space for a single battery of fixtures.

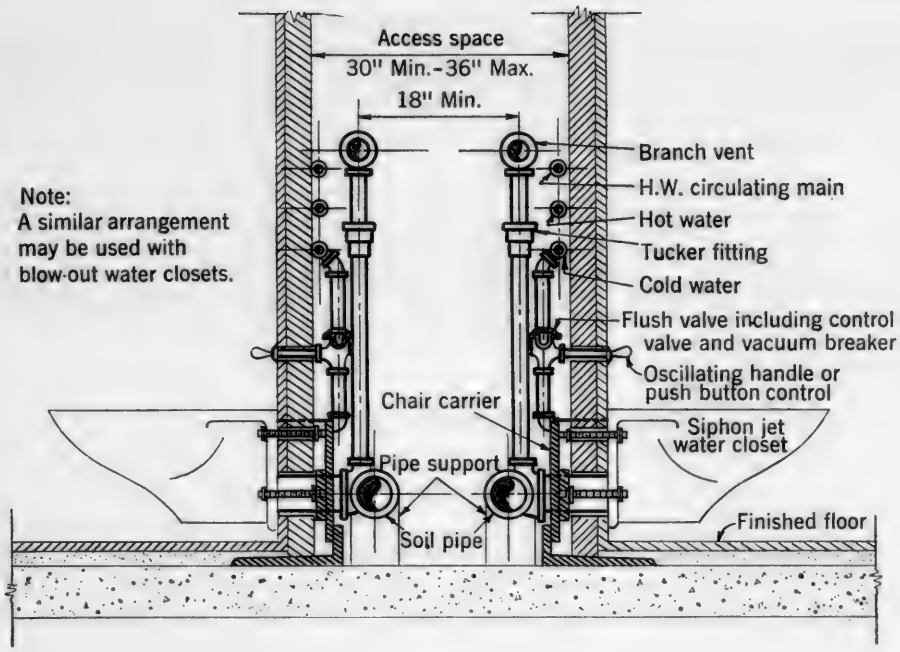


Fig. 2. Access space for a double battery of fixtures.

found in a men's toilet room, and the other battery consists of water closets and lavatories as installed in a women's toilet room. Fig. 2 is a typical arrangement of such a condition.

In Fig. 2, again, only the water closets have been shown since their roughing dimensions determine the required extra space needed for access. Although, patented closet fittings could be used to best advantage in this case, conventional type fittings were used for the purpose of illustration.

In an access space of this kind, the important consideration is to provide a clear passage through which a man may freely move and operate for maintenance and repair. To accomplish this, the soil, waste, vent and water piping must be installed close against each wall. Soil lines, especially, should not interfere with clear passage through the space and should, therefore, be installed along each wall. The installation of the piping, as shown, will be more costly than regular roughing but it is necessary in order to keep the space clear.

Entrance to this space is usually provided by means of a full size access door at the end of the space. If this is not possible, then a smaller access door must be provided at some convenient location preferably in the men's toilet.

With these considerations, it will be possible to provide an access space of minimum, yet adequate size for easy inspection, and repair of the valves and piping.

Advantages of an Access Space

The width of access space shown in Figs. 1 and 2 are sufficient for any type of plumbing fixtures used. This includes floor type water closets or any other combination of plumbing fixtures normally installed in the toilet rooms.

By means of the access space, the necessary maintenance and repair may be performed without disturbing persons using the toilet facilities. Access space illumination can be furnished by a fixed electric light and an electric utility outlet into which an extension cord may be plugged.

Water flow in the piping must be cushioned to avoid the objectionable noise that water hammer can cause. This cushioning effect is usually obtained by individual pipe air chambers at each fixture supply take-off, or by single pipe air chambers at the end of the cold and hot water branches. Mechanical type air chambers may also be used at the end of these branches. When pipe air chambers are used, the air cushion requires frequent air replenishment to make up for air that is gradually absorbed by the water. To replenish this air, it is necessary to shut off the valves controlling the water branches and to open the fixture faucets or flush valves. This will allow the water in the pipe to drain and air to enter. When the water is turned

(*Concluded on page* 158)

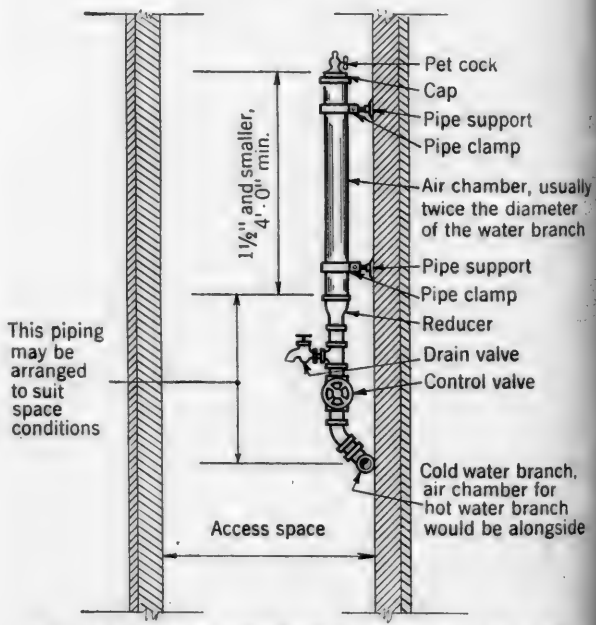
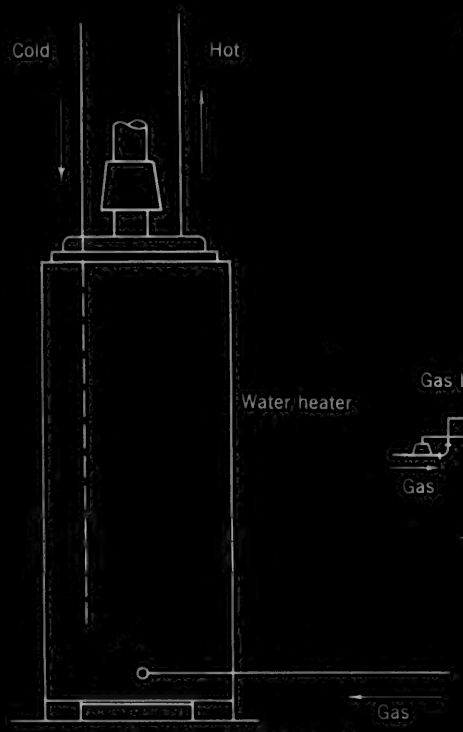


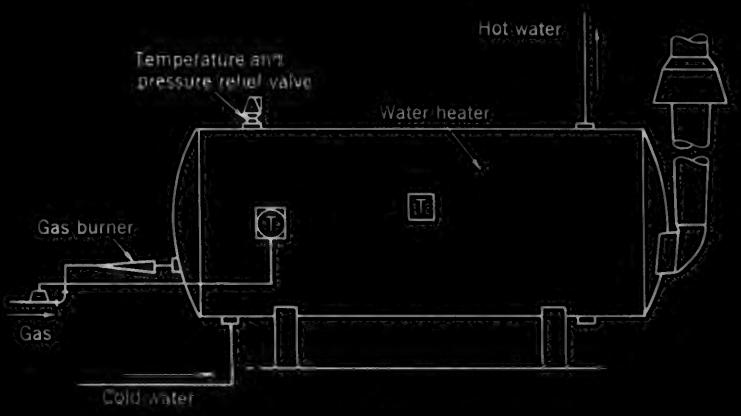
Fig. 3. Typical air chamber at end of cold and hot water branches.

SERVICE HOT WATER PIPING

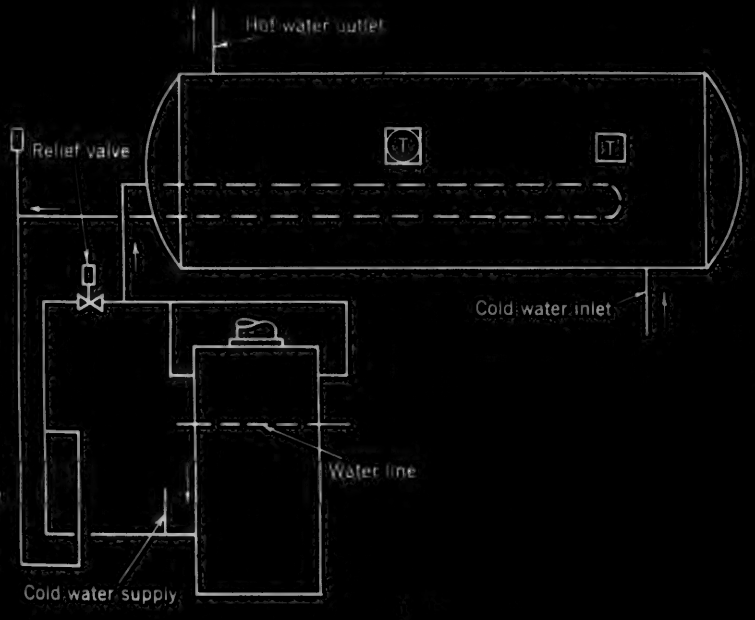
WITH GAS AS SOURCE OF HEAT



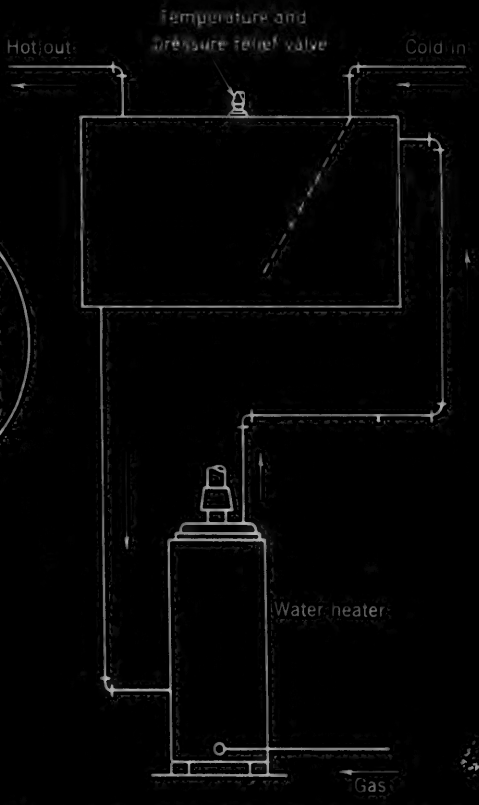
VERTICAL SELF-CONTAINED GAS STORAGE WATER HEATER



HORIZONTAL SELF-CONTAINED IMMERSION FIRED GAS STORAGE WATER HEATER



INDIRECT WATER HEATING SYSTEM
STEAM BOILER HEATS
COILS IN HOT WATER STORAGE TANK

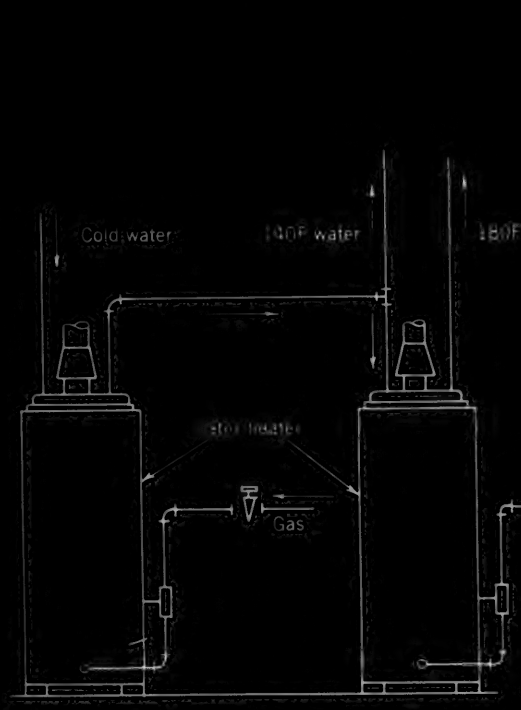


LARGE VOLUME INSTALLATION WITH HORIZONTAL TANK AND SEPARATE GAS INSTANTANEOUS OR CIRCULATING TANK WATER HEATER

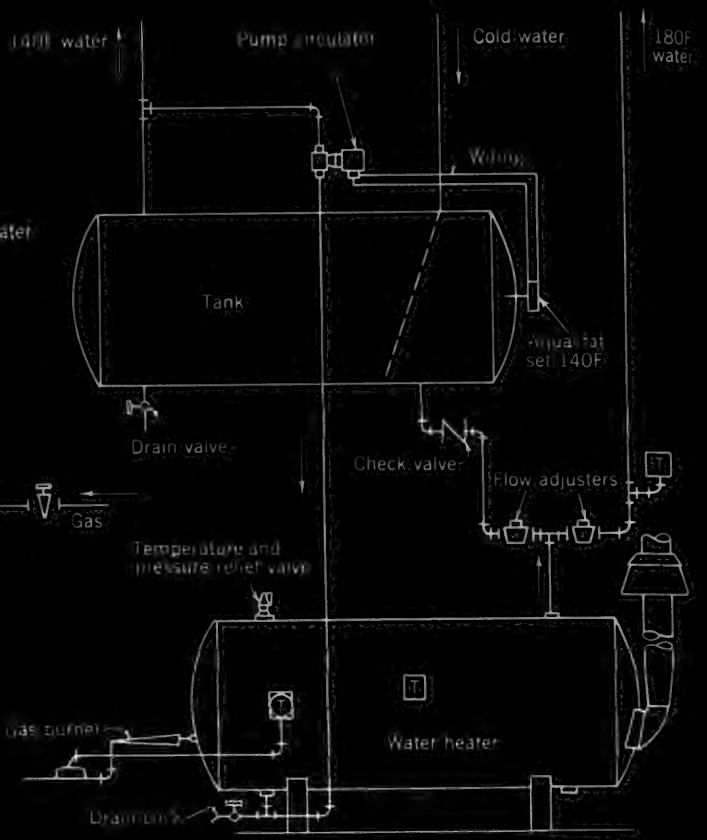
HEATING AND VENTILATING'S DETAIL SHEET

SERVICE HOT WATER PIPING

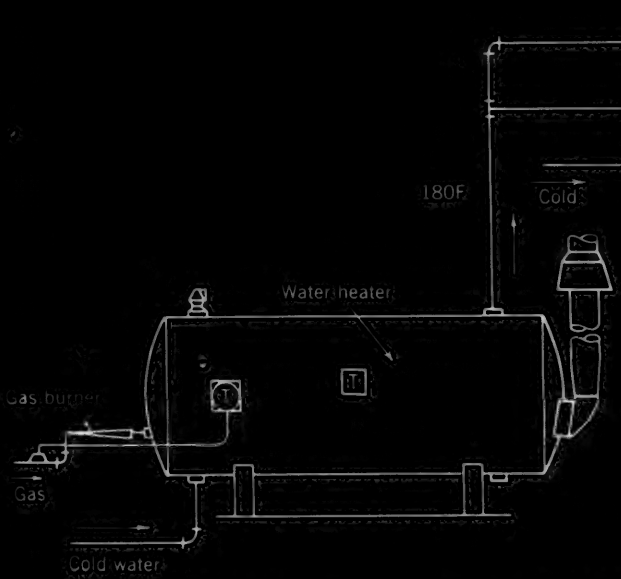
WITH GAS AS SOURCE OF HEAT



TWO VERTICAL SELF CONTAINED GAS STORAGE WATER HEATERS FOR TWO-TEMPERATURE WATER SERVICE



HORIZONTAL, SELF CONTAINED WATER HEATER CONTROLLED BY ITS THERMOSTAT TO MAINTAIN 180F WATER IN STORAGE. AQUASTAT IN THE SEPARATE STORAGE TANK CONTROLS THE CIRCULATOR



HORIZONTAL SELF CONTAINED GAS WATER HEATER, PROVIDING 180F WATER. 140F WATER IS SUPPLIED BY MIXING COLD WATER WITH THE 180F WATER IN A THERMOSTATICALLY CONTROLLED MIXING VALVE

IN ALL DRAWINGS

T THERMOMETER

T THERMOSTAT

HOOKUPS ARE REPRODUCED THROUGH THE COOPERATION OF THE AMERICAN GAS ASSOCIATION

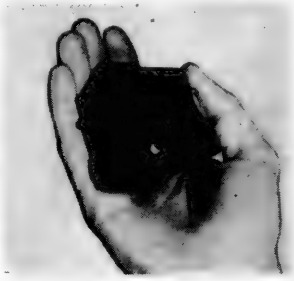
HEATING AND VENTILATING'S DETAIL SHEET

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 129 for securing additional information on items described here.

New Motor Starting Relay

A new motor starting relay, smaller, less expensive, and of a more advanced design than previous models, is announced by the Appliance Control Dept., General Electric Co., Schenectady, N. Y.



The new relay, designated type ARR-1 is available in ratings up to 5 hp, 115/230 volts.

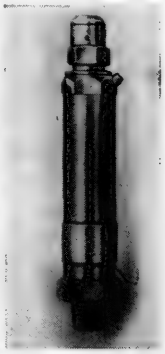
Designed specifically for starting single-phase capacitor-start, and capacitor-start capacitor-run fractional or integral-horsepower motors, the relay can be used to replace the centrifugal switch. It is stated, that the relay is particularly applicable where adverse atmospheric conditions exist or where it is desired to have remote control incorporated into an explosion-proof case. Most common application for the relay is in the starting of single-phase, heremetically-sealed, refrigerator compressor motors.

Calibrated at the factory to pick up at a predetermined voltage, the relay coil is wired across the starting winding of a single-phase motor. In operation, the relay picks up only when the motor comes up to speed, increasing the induced voltage in the starting windings.

More information? Circle Item 1 on postcard, page 129

Chamber Vents for Heat System

The development of Duovent automatic chamber vents is announced by the Keeney Mfg. Co., Newington, Conn. The vents are designed to increase the efficiency of baseboard and convector hot water heating systems by creating a high point for collection of air.



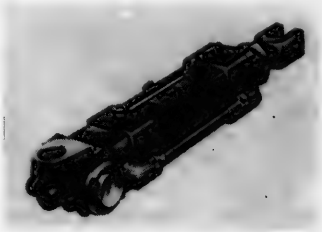
Automatic venting is factory-set and no adjustment is needed. When it is desirable during initial installation to vent manually, the vent is readily accessible from any angle, and no screwdriver or coin is required. The vent is designed to eliminate the need for several joint connections and nipples.

These chamber vents are available in plain brass or polished chrome finish in three sizes to fit specific job requirements. No. 36 (shown) measures 3⅜ inches from the bottom of the hex to the top of the valve; No. 35 measures 2⅝ inches; and No. 34, 2 3/16 inches.

More information? Circle Item 2 on postcard, page 129

Motor Has Sealed Lubrication

Designed to combine a cylinder, a four-way valve and a variety of valve controls in one compact unit, air motors by Lehigh Foundries Inc., Easton, Pa., are now being marketed in bores of 1½, 2 or 3 inches with any desired stroke. Only one air connection is required to bring air to the air motor.



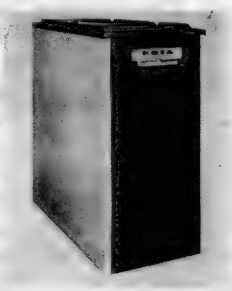
The built-in valve can be operated either manually, by air or by electricity. If desired, it can be operated by one of these means in one direction and another in the opposite direction. Air operation is by means of poppet or bleeder valves which control the movement of the four-way slide valve and therefore control the air motor itself. A feature of these air motors is sealed-in lubrication. The pistons are hollow and filled with lubricating oil which is sealed in at the factory. This oil is fed out through small radial holes by capillary action to a wick in a groove cut in the O.D. of the piston. This assures a constant film of oil on the inside cylinder wall between the two piston cup seals. The valve can be operated electrically utilizing any one of several different types of control for built-in solenoids. The valve body is made of high quality bronze. The valve piston is stainless steel. The slide valve is bearing bronze, sliding on a steel bar stock base which assures freedom from grooving.

These air motors can be furnished with or without adjustable cushions at either or both ends of the cylinder. All units have adjustable speed control of the piston rod in both directions. Nine different types of mountings are available. The motors are suitable for air pressure up to 200 psi.

More information? Circle Item 3 on postcard, page 129

Oil and Gas-Fired Furnaces

A new design in oil- and gas-fired furnaces particularly designed for the mass builders trade is introduced by The Heil Co., Milwaukee, Wis. It is stated that these units are the first which this company has placed on the market for multiple installations at a competitive price.

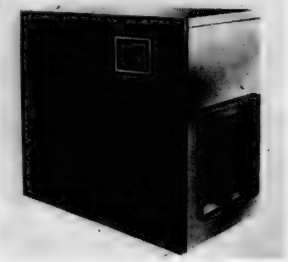


For oil, the model BF-O furnace is rated at 84,000 Btu per hr at the bonnet, while its companion unit for gas has an input rating of 90,000 Btu per hr. The units are completely convertible from one fuel to the other and are shipped factory-assembled and wired for installation.

More information? Circle Item 4 on postcard, page 129

Conditioner Has Zone Selector

The Sunwarm SAC-2 Air Conditioner with optional zone selector, designed for small and average size homes, is being made available on a nationwide basis by Sunwarm, Inc., Kingsport, Tenn. The air conditioner uses Freon-12 refrigerant. Since the unit uses no water, plumbing connections and cooling towers are unnecessary.



The unit features a built-in safety control system. The zone selector, available as an extra feature, divides the home into two separate zones: living zone and sleeping zone; and air-conditions either one at a turn of a switch. The manufacturer states that by thus channeling the cool air where it is most needed, a reduction is made in operating cost, giving homeowners an added economy.

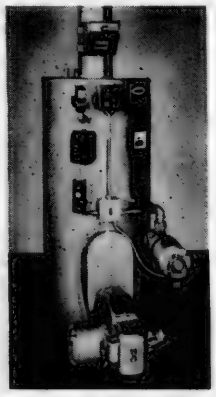
The only maintenance required for the air conditioner is an occasional cleaning of the filter, which is easily done by the homeowner by merely dipping the filter rapidly in a tub of hot water.

More information? Circle Item 5 on postcard, page 129

Addition to Boiler Line

The addition of boiler burner units and commercial hot water supply boilers to its lines is announced by Herco Oil Burner Corp., Lancaster, Pa.

The tankless coil boiler-burner units (left photo) furnish both heating and hot water needs for small and medium size houses. There are five compact sizes from 99 to 252,000 Btu per hr. The units are completely packaged, ready to set in place and connect. The oil burner and all controls are installed and prewired at the factory.

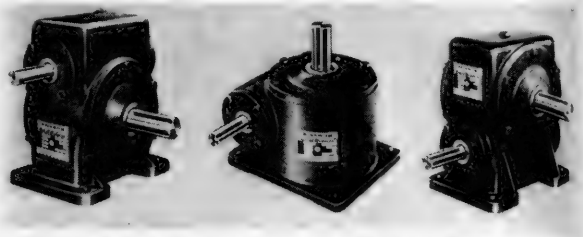


The commercial hot water supply boilers (right photo) are made in five sizes from 19 to 39 gal capacity for small and medium size commercial establishments. Unit consists of green enameled galvanized shell, insulated boiler jacket and combustion chamber. The oil burner and controls are packed separately. Output ranges from 100-255 gal per hr at 100 F rise.

More information? Circle Item 6 on postcard, page 129

Speed Reducers in 3 Designs

Developed to provide greater capacity within more compact dimensions, an entirely new C line of worm gear speed reducers is being marketed by Winsmith, Inc., Springville, N. Y. The new line consists of three new designs CB, CT and CV, in 13 sizes each.



The first five sizes, within the 1/100 to 5 hp range, in ratios of 5:1 to 60:1, are now available. The balance of sizes, already designed, will be in production soon. The manufacturer states, that with greater capacity built into each size reducer, smaller units may be used to meet individual requirements in many instances.

Fulfilling all American Gear Manufacturing Association standards, the new speed reducers are equipped with gears, bearing and shafts rated for AGMA Class 1 Service. Housings are of one-piece construction and reinforced for secure mounting and smooth, vibrationless operation.

The manufacturer states, that although C line reducers have been compactly designed to meet minimum space requirements, surface area provides ample heat radiating capacity.

More information? Circle Item 7 on postcard, page 129

New Drilling Machine

After considerable experimenting, a new type Mole diamond drilling bit and a new light-weight portable drilling machine are introduced by Molco Drilling Machines, Inc., Washington, D.C. The Mechanized Mole is designed to turn out either a production job or an individual hole.

The new drilling machine, using diamond bits, can cut through hard aggregate and steel reinforcing bars without loss of drilling speed. It will drill through concrete, reinforcing bars, eye-beams, and pipe or any other hidden objects.

It is stated that the machine will cut a one to six inch diameter hole in a foot of concrete in less than two minutes, and will drill one-half to six inch diameter holes, eighteen inches deep, in a single operation. Deeper holes may be drilled by placing extension shafts on the bit.

The machine can be used for cutting holes in existing building for service lines, conduits, pipe drains, water pipes, anchoring machinery, and test cores.

More information? Circle Item 8 on postcard, page 129

1954 Line of Lowboy Furnaces

A new line of heating and air conditioning equipment including Deluxe Lowboy furnaces for gas and for oil are introduced by The Heil Co., Milwaukee, Wis. Inside and out, seven basement-type winter air conditioners exhibit a completely new design.

New octagonal heat exchanger design, matched and separated plenum openings and free floating fan division panel are among the twenty-five design changes offered with each of the 1954 Lowboys. Oil-fired units feature the new CB-1 high pressure burner, flange mounted in rubber for silent, vibration-free performance. The new AF Series includes three winter air conditioners for oil, rated at 95,200, 112,000 and 123,200 Btu per hr at the bonnet. Four gas-fired models with AGA input ratings of 80,000, 100,000, 125,000 and 150,000 Btu per hr, respectively, comprise the new AFG Series.

All units are shipped factory-assembled and wired, and are readily convertible from one fuel to the other.

More information? Circle Item 9 on postcard, page 129

Refrigerant Dispensing Valve

A new universal refrigerant dispensing can valve, designed for use with all known canned refrigerants, is being produced by Superior Valve & Fittings Co., Pittsburgh, Pa. The universal piercing valve is a packed type shut-off valve incorporating a ¼-inch SAE Flare outlet for attachment to any standard charging hose.

The valve incorporates a quick piercing and sealing action that pierces clean and seals positively. A frost-resistant rubber gasket is the seal. The self- contained valve allows any portion of the canned refrigerant to be expelled without having to dispense the entire can. The clamp and valve are designed to be reused indefinitely.

More information? Circle Item 10 on postcard, page 129

Boiler-Burner Unit

A new higher SBI net rating of 87,000 Btu per hr, 580 net sq ft hot water radiation for its 770 boiler-burner unit is anounced by Fitzgibbons Boiler Co., New York, N. Y. In addition, the 770's Tanksaver will deliver 180 gal of domestic hot water per hour.

The manufacturer states, that although priced for the competitive market, the fully pre-assembled and wired 770 oil fired boiler meets or exceeds the ASME Code.

Catalog 770-10-1 is available.

More information? Circle Item 11 on postcard, page 129

Stone-Lined Water Heater

A new electric water heater, designed specifically for the New England area, is placed on the market by the Electric Appliance Div., Westinghouse Electric Corp., Mansfield, Ohio.

Available in 52, 66, and 80 gallons capacity, the inside of the tank is lined with at least ⅜ inch of rust proof hydraulic stone to assure complete protection against rust and corrosion. Each tank is covered by a 20-year protection policy against failure of the tank. Compact tri-snap thermostats, clamped directly against the wall for accurate temperature control, are built to withstand abnormal power surges and are sealed against dirt and dust. The thermostats can be set to deliver hot water from 120 F to 170 F. Features in the stone-lined model include the Corox direct immersion heating elements that put all the heat directly into the water, heavy Fiberglas insulation to prevent heat loss and a baffle that keeps the incoming cold water from mixing with the stored hot water, thus providing more usable hot water from every tankful.

Both inlet and outlet water connections are accessible for standard ¾-inch connections. A drain valve is located in the bottom of the tank to allow complete flushing out of sediment left by water. The exterior steel jacket is finished with white Dulux high-gloss enamel, baked on in built-up coats. Inside surfaces are protected against corrosion.

More information? Circle Item 12 on postcard, page 129

Redesigned Gas Valve

Improvements designed to increase the utility of its B-60 gas control valve for gas appliances from both the operational standpoint and the installer's have been incorporated in the latest models announced by General Controls Co., Glendale, Calif. The B-60 valve was originally developed by the company some 15 years ago and is said to have been the first self-operated gas valve of its kind. Since then it has been the object of continuing research and development by the manufacturer.

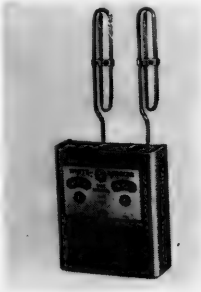
The latest model valve, which forms the heart of the B-60 self-powered heat-control system, has a number of features that are of particular interest to the heating equipment manufacturer who desires a valve permitting flexible and easy installation. The new unit is a multi-poise type. The new valve has an accessible terminal block to insure ease in wiring. The unit has been reduced in size, and while the physical envelope is smaller, gas capacity has been increased.

For installations utilizing a limit switch a terminal block provides separate terminals to facilitate wiring. These terminals are normally connected with a jumper wire. In cases where limit switch wiring must be run in conduit, a conduit cover can be supplied for the valve.

More information? Circle Item 13 on postcard, page 129

New Warm Air Controls

Warm air controls which are cataloged and available with regular sensitive elements of 9 and 17 inches and also with elements on capillaries of 24, 30, and 36 inches are introduced by White-Rodgers Electric Co., St. Louis, Mo.



A feature is the universal contact structure now on the limit controls which enables a single control to handle all voltages from millivolts to 230 volts. This simplifies control inventories, as it is only necessary to stock one type to take care of all gas and oil installation requirements.

These controls feature a hammered silver-grey finish.

More information? Circle Item 14 on postcard, page 129

Plate Type Fin and Tube Core

A new Monofin core, a plate type fin and round tube core is being produced by Young Radiator Co., Racine, Wis. They are adaptable for engine cooling units and for cooling oil, gas, compressed air, and for air conditioning heating and cooling functions.

Tubes sheathed with these fins are removable when damaged, maintaining full heat transfer efficiency of the entire core area. Straight-in-line fin arrangement permits maximum air flow for high efficiency cooling with minimum pressure drop with resultant savings in horsepower and greater fin cleanliness. They have a positive mechanical bond with fin-collar to fin-collar contact along the entire length of the tube adding to bursting strength and protecting it from injurious impingement and atmospheric corrosion. They can be used with any tubing material without brass or solder problems.

More information? Circle Item 15 on postcard, page 129

Variable Resistor Cuts Arcing

Arcing, the main cause of contact failure in mercury-in-glass thermostats, can now be eliminated by the use of an electronic device called the Princo Stat-Varistor, a new product announced by Precision Thermometer & Instrument Co., Philadelphia, Pa.

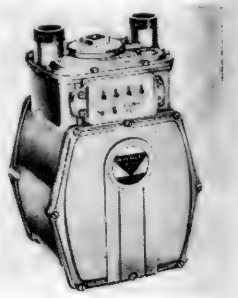
Normally, arcing occurs when the thermostat circuit opens. At this moment the magnetic energy stored in the relay changes quickly to surging electrical energy which unloads through the thermostat. According to the manufacturer, in laboratory tests this surge across the thermostat was measured at 2750 volts in a circuit using a power supply of 117 volts ac. On 100 volts dc, the surge was nearly 1000 volts. This punishment causes contacts to fail prematurely. It is stated that these voltage surges can be cut down to negligible proportions by using this resistor. In the circuits just described, the manufacturer states that it held the voltage surge down to 170 volts when on ac and 50 volts on dc, and with no arcing. In both cases, the point of reference was 0 volts.

The resistor is a small device measuring 1 inch in length by ½ inch in diameter. It is constructed of a series of special selenium plates that are hermetically sealed in glass. It eliminates destructive arcing by changing resistance as the voltage across it is changed. The resistance is high at low voltage and drops off quickly as the voltage rises. Thus the surge of electrical energy which might cause damage is absorbed by the resistor protecting the contacts of the thermostats and, as a result, gives the thermostat longer life.

More information? Circle Item 16 on postcard, page 129

High Capacity Domestic Meter

A new Aluminumcase meter, with a rated capacity of 225 cu ft per hr of 0.6 specific gravity gas at ½-inch water column differential, and a working pressure of 5 psi is announced by American Meter Co., New York, N. Y. The company states that the new meter has been developed to meet the need for larger capacity, light weight and low cost in positive displacement gas meters for domestic service.



Features of the new meter include the use of pressure die-cast aluminum alloy construction to reduce weight while providing high-impact resistance. Interior construction of the newly-styled meter includes the use of precision machine operations throughout to insure complete parts interchangeability; permanently self-lubricated porous bronze bearings; choice of synthetic or leather diaphragms and new grommet-type bushings.

The new index box featured in the meter has been designed of clear, high-impact strength plastic to provide resistance to injury and easy meter reading.

More information? Circle Item 17 on postcard, page 129

Water Treatment Unit

A complete service of water treatment is offered for preventing rust, corrosion, iron, scale and algae, in the form of Jud syncro feeders, a development of Water Treatment Engineers, Inc., Cleveland, Ohio.

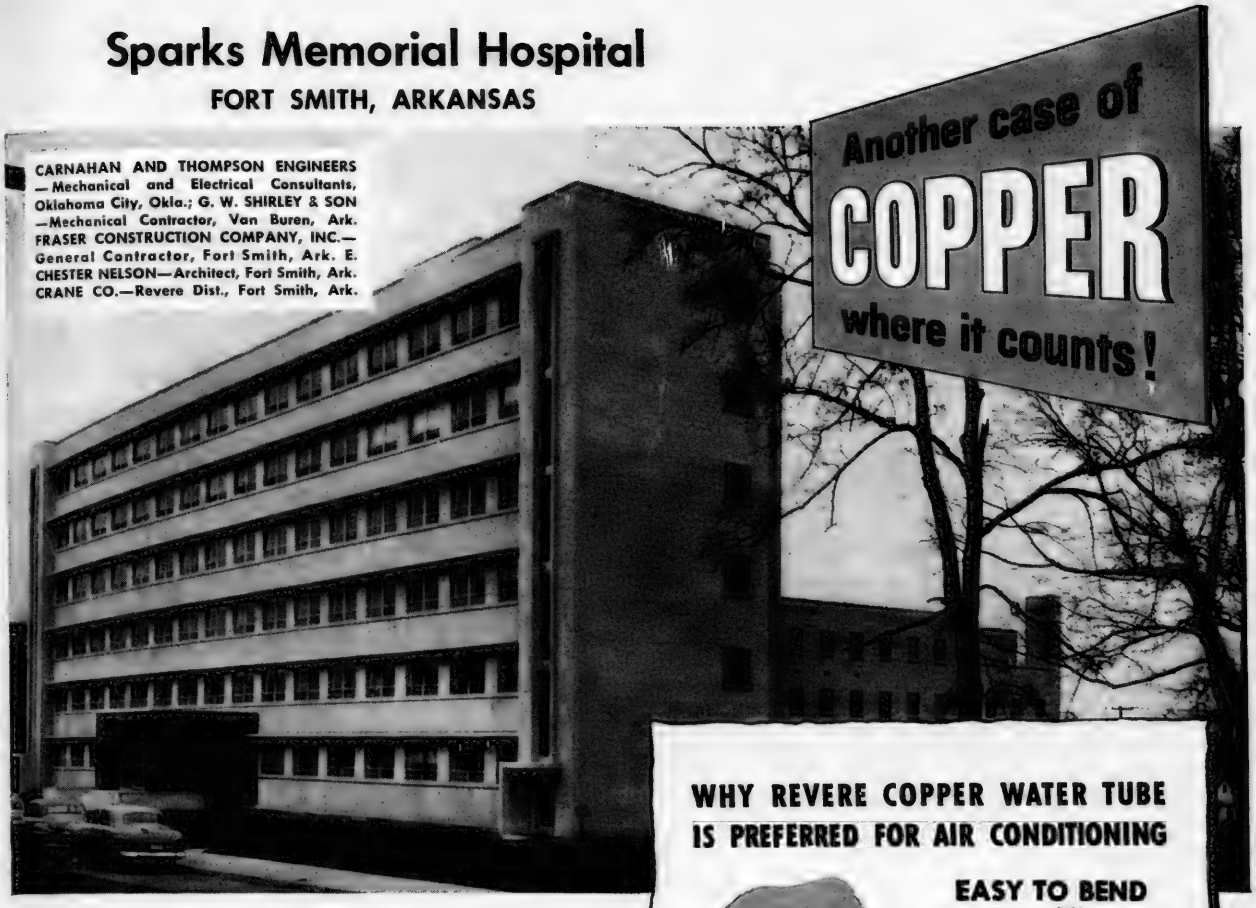
Although the syncro feeders soften water, they do not have to be regenerated or backwashed. WTE formulations are clear, straw or amber color liquids, which are patented and fully guaranteed to give results in hard or soft water (irrespective of hardness); used for air conditioning systems, condensers, compressors, cooling towers, and boilers.

More information? Circle Item 18 on postcard, page 129

(*Continued on page* 118)

Sparks Memorial Hospital

FORT SMITH, ARKANSAS



CARNAHAN AND THOMPSON ENGINEERS —Mechanical and Electrical Consultants, Oklahoma City, Okla.; G. W. SHIRLEY & SON —Mechanical Contractor, Van Buren, Ark. FRASER CONSTRUCTION COMPANY, INC.—General Contractor, Fort Smith, Ark. E. CHESTER NELSON—Architect, Fort Smith, Ark. CRANE CO.—Revere Dist., Fort Smith, Ark.

28,000 lbs. of Revere Copper Water Tube used for air and oxygen systems, hot and cold water lines

Here is an interesting example of the versatility of Revere Copper Water Tube. Because of the characteristics of copper tube it can be used to carry various fluids and gases encountered in hospitals without frequent replacement which would be necessary should rustable pipe be used. Also, the solder or compression fittings used with copper tube assure the tightest kind of joint possible, preventing dangerous leaks. Just check the many outstanding features of Revere Copper Water Tube in panel at right and you'll see that there is not another metal, alloy or other material that has all the outstanding construction characteristics of copper. Yet its initial cost, though slightly more in some cases, is much less per year of service.

Keep out of trouble with copper. Use Revere Copper Tube for air conditioning lines, radiant panel heating, hot and cold water lines, underground service lines, waste stack and vent lines, processing lines.

REVERE

COPPER AND BRASS INCORPORATED

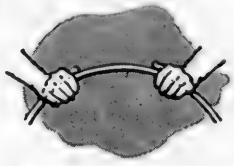
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

WHY REVERE COPPER WATER TUBE IS PREFERRED FOR AIR CONDITIONING



EASY TO BEND

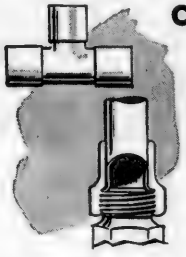
Saves Time

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions.

HANDY LENGTHS

Save Fittings... Labor

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.



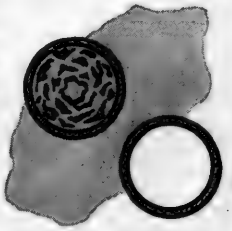
SOLDER OR COMPRESSION FITTINGS

Need Less Work Room ...Save Metal

No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NON-RUSTING

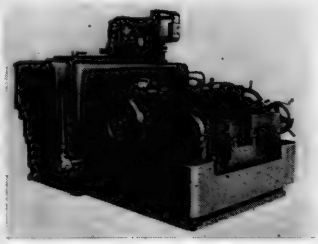
Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.



(*Continued from page* 116)

Heavy Duty Threading Machine

The development of a heavy-duty threading machine for the production threading of large diameter pipe and nipples is announced by Landis Machine Co., Waynesboro, Pa. This double spindle-heavy duty machine features a 1 to 4-inch pipe range, if furnished with the 4-inch threading head.



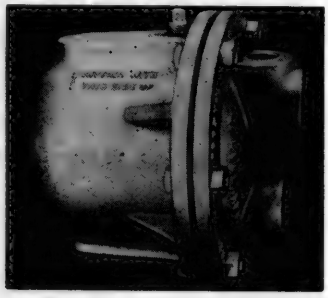
Called the 48 C Landmaco, the threading machine has twelve spindle speeds ranging from 9 to 152 rpm which are available by the use of three pairs of pick off speed change gears. A single gear shift lever provides a rapid speed change of 25% for any given spindle speed as determined by the change gears in use. The bed is of massive construction and equipped with hardened and ground rectangular ways for guiding and supporting the carriage.

Other features include: a large screened opening over the coolant side of the machine and an extra drip ledge around the bed to return any coolant overflow. The machine can also be furnished with a 6-inch head for 2½ to 6-inch pipe.

More information? Circle Item 19 on postcard, page 129

Float-Type Moisture Trap

A new No. 81 float-type moisture trap is being marketed by V. D. Anderson Co. Cleveland, Ohio, who states that it is to fill the simplified, low cost, float trap on air, gas and steam applications. Well designed and compact, this unit has good capacities for its size and is designed as a method of draining moisture and condensate continuously and automatically from piping systems, Hi-eF Purifiers and other equipment which handle air, gas or steam. They are suitable for operating pressures up to 200 psig and have an optional inlet.



The trap consists of a stainless steel valve and seat, and lever, plus a copper hide float inside a cast semi-steel case. A stainless steel float can be furnished when specified. The valve is opened by liquid raising the float and closed when float drops the liquid level. These traps are furnished with either ½- or ¾-inch connections, and are tested under working conditions at the factory after assembly.

List price of the trap with copper hide float is $17.00; stainless steel $22.00.

More information? Circle Item 20 on postcard, page 129

New Line of Gear-Motors

A new line of fractional-horsepower gear-motors, smaller and lighter than previous designs, is announced by General Purpose Component Motor Dept., General Electric Co., Schenectady, N. Y.

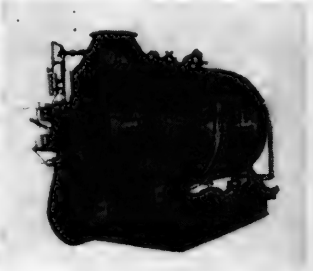
The new right-angle and concentric-shaft gear-motors are lighter than previous models, according to the manufacturer. The driving motor is close-coupled and positively geared to the output shaft. The motors are reconnectable externally to reverse the direction of shaft rotation. Large bearings, with extra high thrust capacity, are locked to carry motor shaft thrust in either direction. Both motors are designed for use on such applications as machine tools, pumps, printing equipment, conveyors, strip feeders, material handling equipment, commercial laundry equipment, and advertising display devices.

The concentric-shaft motor is available in ratings of ¼, ⅓, ½, and ¾ hp, from 13.5 to 520 rpm, 115/230 volts single-phase and 220/440 volts three phase. The right-angle shaft gear motor is available in ratings of ¼, ⅓, ½, and ¾ hp, from 24 to 148 rpm, 115/230 volts single phase and 220/440 volts three-phase.

More information? Circle Item 21 on postcard, page 129

Extra-Small 250 Hp. Boiler

An exceptionally small 250 hp firetube steam generator is announced by Cyclotherm Div., United States Radiator Corp., Oswego, N. Y. The boiler is only 9 ft, 5 in long. The manufacturer states that it is so small that it has been adapted to multiply power in small out-grown boiler rooms as much as four times, as well as to marine installations.



The 250 hp generator requires an installation space of 9 ft, 5 in long, 6 ft wide and 6 ft, 8 in high. Called the MC 250, it burns either oil or gas, or oil and gas. For marine installations the unit can be adapted to burn the same diesel fuel that propels the ship. The unit is designed for 15 to 200 psi pressure. It delivers a maximum guarantee of 7500 pounds of steam per hour with a normal operating capacity of 6250 pounds per hour. The boiler is equipped with a modulating unit that operates from 30 to 100 percent of capacity.

The new 250 hp boiler is expected to be installed in metropolitan areas where space is at a premium, in plants where management desires a considerable power increase without making expensive structural plant renovations.

More information? Circle Item 22 on postcard, page 129

(*Continued on page* 120)

NICHOLSON

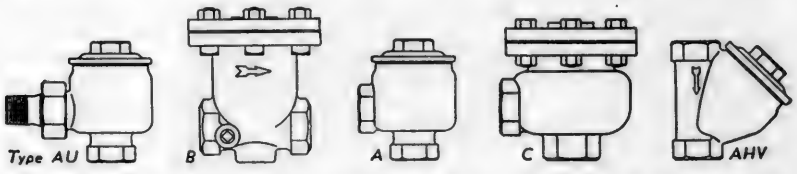
Steam Traps feature

LESS parts

MORE capacity

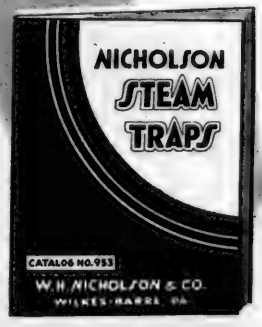
Note the extreme simplicity of Nicholson industrial steam traps. The heavy-duty bellows integral with valve is the only moving part -- a substantial factor in their low maintenance cost. See also the larger valve orifice. This noteworthy feature results in Nicholson's 2 to 6 times average drainage capacity.

A recent survey showed the features following also to be reasons why plants with standardization-for-economy programs are increasingly adopting Nicholson traps: (1) Operate at lower temperature differential; fast action keeps equipment full of live steam; higher temperatures. (2) No air-binding; eliminate costly fluctuation of operating temperatures. (3) Freeze-proof; freely installed outdoors. (4) No need to change valves for varying operating pressures. (5) Record for low steam waste; as little as 1%.



FIVE TYPES FOR EVERY PROCESS, HEAT, POWER USE

Bronze, semi-steel or cast steel construction. All 5 types have stainless steel valves and seats; bronze, monel or stainless steel bellows. Sizes, ¼" to 2"; pressures from vacuum to 250 lbs.



SEND FOR TRAP CATALOG 953

This 32-page standard reference is complete with installation diagrams as well as charts and formulae for determining proper size of trap.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

199 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 58 Principal Cities

(*Continued from page* 118)

Collector Solves Dust Problem

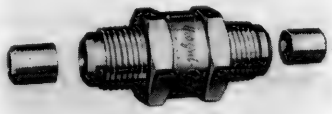
The development of its Type CW-1 centrifugal wet dust collector for those dust control problems which cannot be solved by the use of cloth type collectors is announced by Pangborn Corp., Hagerstown, Md. These problems include: (1) High temperature or moisture; (2) explosive or combustible dusts; (3) corrosive, highly abrasive and/or obnoxious dusts; (4) combinations of the foregoing.

The new collector is of counter-current design (air flow counter current to water flow), and of tower type construction. It consists of multiple wet vane sections and a final water entrainment vane section. The diameter of the collector varies in proportion to the air volume handled and the number of wet vane sections is governed by application requirements. The unit has four wet vane sections, followed by a single water entrainment section. The water supply enters above the top wet vane section and flows downward or counter to the upward flowing air, which enters the collector through the lower tangential inlet. Water and dust are discharged as sludge from the lower cone and the clean air from the air outlet at the top. After clarification in settling tanks, the water may be recirculated since no spray nozzles are used, the water inlet being an open end pipe.

More information? Circle Item 23 on postcard, page 129

New Valve Connection

A new valve connection for the refrigeration industry, the T-S connection, has been developed by Wagner Tool & Supply Corp., Long Island City, N. Y.



The new connection is designed to permit installation of valves, driers, strainers and all other accessories normally installed with a flare or a solder connection. Installation is accomplished without the use of any new or additional tools.

The manufacturer states that the new connection has been incorporated into the company's Magni-Chek valve.

More information? Circle Item 24 on postcard, page 129

Additions to Line of Signs

The addition of over 7,500 new stock items used for pipe markers, container signs, chemical industry and maintenance and repair operations is announced by North Shore Nameplate, Inc., Bayside, L. I., N. Y.

Standard card size is 2¼ x 9 inches and furnished in various colors. Identification tapes require no moistening, are easily applied to round as well as flat surfaces, and are not affected by cold, humidity or vibration.

They are mounted on special white fibre backing cards and are easily removed for instant application.

More information? Circle Item 25 on postcard, page 129

Igniters and Spark Plugs

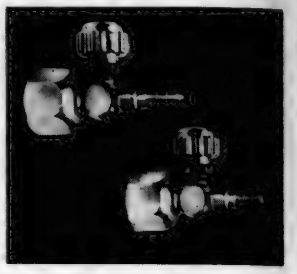
Three new designs of igniters and spark plugs for industrial and commercial oil and gas burners are announced by U. S. Igniter Corp., Philadelphia, Pa. The manufacturer states that these plugs eliminate the difficulties experienced by conventional designs and by center and ground electrodes.

One type of plug, as shown, eliminates the need of two plugs as formerly used. Another design, also shown, is employed where high thermal corrosion and erosion occurs from high velocity return gases.

More information? Circle Item 26 on postcard, page 129

Gas and Air Valve

A new, completely leak-proof gas and air valve for the plumbing industry is offered by Harvey Dental Specialty Co., Los Angeles, Calif. Originally designed to meet the needs of dental and medical laboratories, this gas and air valve is highly recommended for use by artists, engravers, jewelers and other craftsmen. Other suggested installations include schools, shops, laboratories and public buildings.

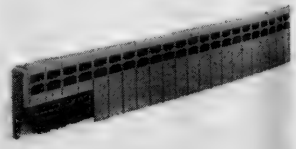


The valve is bronze forged with a satin chorme finish. Monel stem assures a lifetime of leak-proof operation. Adapters fit all standard outlets.

More information? Circle Item 27 on postcard, page 129

Baseboard Radiation

A new baseboard panel radiator for commercial or residential application is introduced by Shaw-Perkins Mfg. Co., Pittsburgh, Pa. The units may be installed in schools, churches, hospitals, offices, hotels, homes, factories or ships.



The units are 3 inches wide, 8 inches high, and are assembled in 2-inch sections from 2-ft, 5-inch, to 72-ft, 7-inch lengths in opposite end supply and return tapping, and 2-ft, 3-inch to 36-ft, 7-inch lengths in right or left end supply and return tapping to fit room piping connections. The steel heating plates are spaced ½ inch apart, which prevents the accumulation of dirt, dust or lint which slows down the air circulation and decreases heat transfer.

Each radiator is packaged with all extras, including mounting screws, floor or wall escutcheon plates, connecting nipples, manifold fittings, and a can of primer touch-up paint, ready to be assembled on the job and then connected to the room piping coming from the boiler.

More information? Circle Item 28 on postcard, page 129

(*Continued on page* 122)

Take this common sense approach to PUMPS

Save Time, Money, Trouble

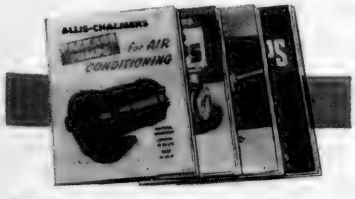
Get specific engineering help

You'll find it pays off in hard cash to rely on Allis-Chalmers for your air conditioning pump needs. That's because your A-C representative or distributor is an experienced, highly qualified specialist who will give you full cooperation at every step of the way. He'll help you pre-engineer the setup. In many cases he'll make valuable suggestions which result in a simpler, more effective layout.

Get immediate delivery from stock

A-C air conditioning pumps in a complete range of types and sizes are carried in stock by Regional Warehouses and Authorized Distributors throughout the country. Your representative will show you how to expedite pump selection and ordering . . . make sure you get the unit that gives you maximum performance at minimum cost. Find out for yourself why it's highly profitable in terms of time, money, and customer satisfaction to install Allis-Chalmers air conditioning pumps. Contact your representative before you start your next job.

A-4396



A-C ALLIS-CHALMERS

Electrifugal is an Allis-Chalmers trademark.

For literature on Allis-Chalmers

FHP Package Pumps get Bulletin 52B7529 . . . *Electrifugal* Pumps, Bulletin 52B6140 . . . Supporting Adaptor Pumps, Bulletin 52B6083 . . . Vertical Mounted Pumps, Bulletin 52B6975. Write Allis-Chalmers, Milwaukee 1, Wisconsin.

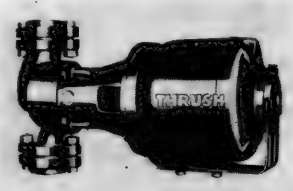
ALLIS-CHALMERS

(*Continued from page* 120)

Circulator Serves for 4 Sizes

An improved circulator incorporating several new features is being marketed by H. A. Thrush & Co., Peru, Ind.

One of the features of the improved circulator is that one circulator serves for 4 sizes by having interchangeable 2-bolt flanges with ¾, 1, 1¼, and 1½-inch pipe tappings. The company states that this feature permits obtaining the correct size circulator by merely replacing the 2 flanges with the necessary size. In addition to the interchangeable flanges, the circulator features adjustable motor cradle, new type resilient motor mounting rings, improved body and impeller, large motor, and continuous oil bath lubrication of circulator bearings.



More information? Circle Item 29 on postcard, page 129

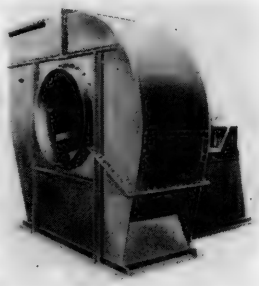
Ultrasonic Fluxless Soldering

An ultrasonic fluxless welding plant, Sonobond, developed by Aeroprojects Inc., West Chester, Pa., will tin aluminum, copper, magnesium and silver without the use of any flux. This equipment is being built with sufficient ultrasonic power to tin these metals readily on a production basis. Experimental or production orders of 1 to 10,000 parts are run in a pilot plant operated by the manufacturer. In this way companies interested in the new process can prove its usefulness as a production method before the purchase of equipment. When a company is satisfied with the process, and production methods have been worked out, it can then procure the equipment best suited to its needs and install the operation in its own plant.

More information? Circle Item 30 on postcard, page 129

Fan Has Varied Applications

A new fan for the field of industrial air and material handling is announced by Clarage Fan Co., Kalamazoo, Mich. Called the XL line, the new fans feature diversified applications and adaptability to other than standard conditions.

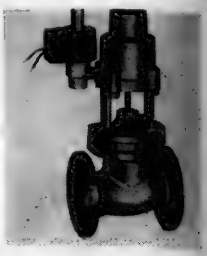


The fans are offered in 16 sizes, with pressures to 18 inches sp, and volumes to 130,000 cfm. In the smaller sizes, a backplate type, open type, or rim type wheel is available. For the larger sizes shown, the rim and backplate types are available. The fans have inlet diameter sizes ranging from 11 through 60 inches.

More information? Circle Item 31 on postcard, page 129

New Line of Solenoid Valves

A new line of cylinder operated solenoid pilot controlled valves for handling corrosive gases and liquids is announced by Automatic Switch Co., Orange, N. J. It is stated that almost any corrosive gas or liquid can be handled since the body material can be selected for the particular fluid. Flexibility in construction permits free choice of body materials to suit the fluid controlled.



Valves are listed with bronze body and trim, cast iron body and nickel alloy trim, cast steel body and stainless steel trim, Aloyco Steel No. 18/s or Aloyco steel No. 20 body and stainless steel trim, and monel body and trim. Other features of the valves are: it can be mounted in any position, the standard valve is suitable for either normally open or normally closed operation, the valves are available with standard, watertight or explosion-proof solenoid enclosures and they are provided with full area ports.

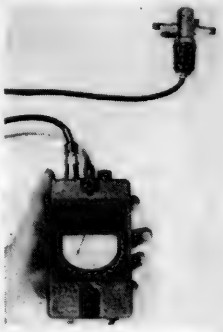
The valves require a separate source of air, water, or oil for operation. Operating pressure is dependent upon the pipe size and auxiliary pressure available. Curves of auxiliary versus main line pressure can be furnished. It is stated that the cylinder, operated from a separate source, provides ample power to operate the valve under the most difficult conditions and allows the use of stainless steel valve bodies which ordinarily would not be directly operated by a solenoid.

Bulletin 8338 is available.

More information? Circle Item 32 on postcard, page 129

New Electronic Flowmeter

An indicator for instantaneous direct readings of gas flow in 50 to 10,000 cc per min range, and small enough to be held in the palm of the hand, is announced by Hastings Instrument Co., Inc., Warwick, Va.



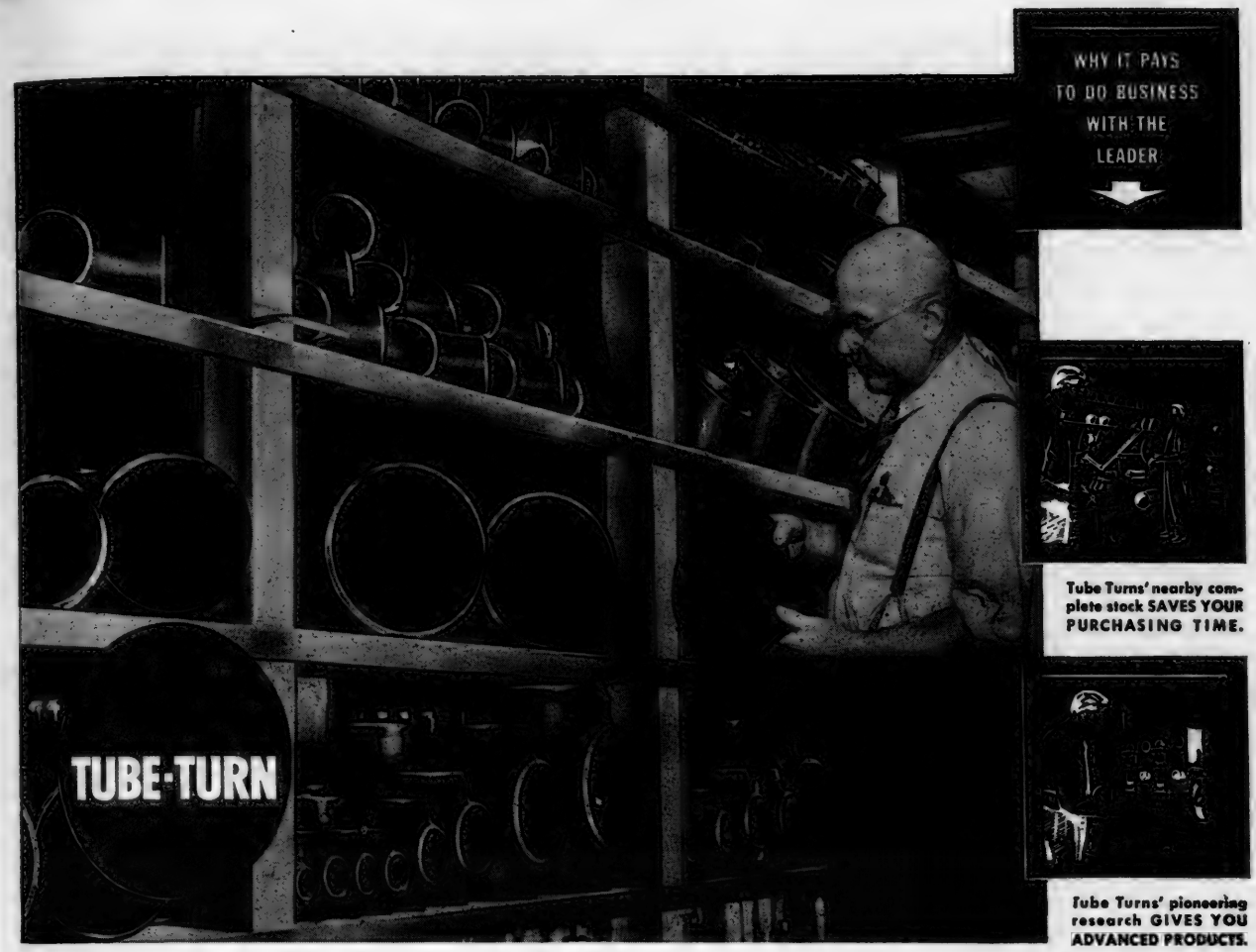
The new 27-ounce unit is designed for such applications as process control and quick line checks.

A directly-heated thermocouple gage tube can be placed in line for low flow rates with practically no pressure drop in line. Unit can be used with long extension cables for remote indications. Logarithmic calibration provides ease of reading in low flow ranges. Its response time is ½ second, and its accuracy is 2%. The instrument may also be calibrated for measurement of mass flow in pounds of air or gas.

Indicator unit is housed in an all-metal case, 3½ x 5½ x 2½ inches. Gage tube employs standard ⅛-inch IPS male thread.

More information? Circle Item 33 on postcard, page 129

(*Continued on page* 124)



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YOU ARE SURE to get the latest cost-saving developments in fittings and flanges when you specify "TUBE-TURN". Year after year since introducing forged welding fittings in the U. S., Tube Turns has consistently set the pace in research, quality control, development of new types, sizes and materials and in piping engineering.

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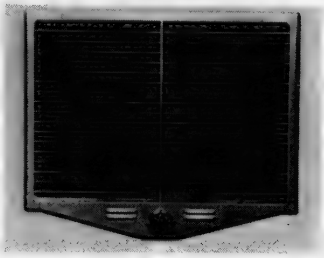
(*Continued from page* 122)

Wall Heater Has Thermostat

A new radiant electric wall heater with a thermostat and pilot light forming an integral part of the unit has been placed on the market by ThermoRay Corp., New York, N. Y. There are two models, designed for surface mounting, rated at 1250 and 750 watts, respectively. Either may be had for operation on 230 or 115 volts ac. Various other models of electric wall heaters are available for recessed or surface mounting.



This new heater has a thermostat containing a pilot light and is completely wired. It needs only to be connected into the circuit. The thermostat is a double pole, single throw temperature controller which automatically cuts off all current to the heater whenever the room temperature reaches the thermostat setting. The unit has been approved by Underwriters' Laboratories, Inc.

These electric heaters have the heating element concealed inside a non-shatterable asbestos panel. The heater has low initial inrush, and high speed with which operating temperature is attained.

More information? Circle Item 34 on postcard, page 129

Tee Added to Line

A new 4-inch tee is being produced by Orangeburg Mfg. Co., Inc., Orangeburg, N. Y. It is the fourth in a line of fittings designed for the company's root-proof pipe and perforated pipe. Like the pipe itself, the new tee requires no calking, cement or compounds. A few taps make a joint which is claimed to be tight against leakage, infiltration and root intrusion.

More information? Circle Item 35 on postcard, page 129

Leak Locating Instrument

A time-saving instrument for detecting and locating leaks in all types of pressure piping systems is announced by Universal Controls Corp., Dallas, Tex. The instrument, Dragnet leak detector, is applicable for testing piping for gas, steam, water, oil, refrigerants, air and other pressure or vacuum systems.

Unit is portable and consists of a test pump, air storage tank, pressure gage, transparent bubble bowl with non-freezing fluid, and a flexible hose for connecting to piping under test.

More information? Circle Item 36 on postcard, page 129

Midget Solenoid Valves

A new series of midget solenoid valves for handling all types of gases and liquids is introduced by General Controls Co., Glendale, Calif. These compact new valves are available in many models for a variety of applications for control of fluids in the domestic, commercial, and industrial fields.

Aside from their small size these new valves of the K-27, K-28, K-29 series have soft seat, tight shut-off construction and are multipose. Among the new group are time delay valves, manual reset valves, two-way on/off valves and three-way valves. Individual valves are designed to handle gas, air, oil, water, as well as corrosive fluids. Aluminum, brass and stainless steel is used as body metal to suit the application. In stainless steel types, all internal parts also are steel to assure long life in the handling of corrosives.

More information? Circle Item 37 on postcard, page 129

New Line of Steel Fans

A completely new line of steel pressure fans is announced by The Moore Company, Marceline, Mo.

Called the Supervent, the new fan line is available in 16 and 24-inch hub diameter models capable of moving up to 50,000 Cfm on the Series 16, and up to 120,000 Cfm on the Series 24. Standard construction is heavy-gage steel, full-welded. Fan diameters range from 32 to 96 inches.

Featuring direct-drive design, fan and motor are an integral unit with no drive shaft, belts, or gear box. The unit features lifetime Silicone lubrication. The mechanical design such, that removal of only three nuts is required to disassemble the mechanism.

More information? Circle Item 38 on postcard, page 129

3000 F Refractory Castable

Production of a new 3000 F high temperature castable under the trade name Hydrecon 3000 for use in municipal and industrial furnaces and boilers is announced by J. H. France Refractories Co., Snow Shoe, Pa. The new cement is designed for use where high heats and severe furnace conditions require a refractory cement capable of actual use to 3000 F.

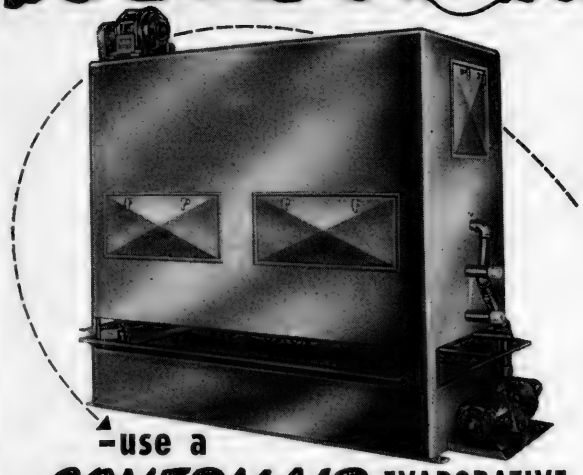
The manufacturer asserts that laboratory tests show a melting point of 3200 F giving the product a safety margin exceeding 200 F. Test results show high resistances to erosion, abrasion, slagging, and spalling, with no permanent shrinkage either on first firing or after repeated cycles.

The castable is shipped dry, ready-to-mix in standard 100 lb waterproofed containers. This product may be poured, cast, tamped, rammed or gunned into place and is recommended by the company, for maintenance patching when brickwork has been subjected to extreme heats.

More information? Circle Item 39 on postcard, page 129

(*Continued on page* 126)

When water is a *Headache...*



-use a

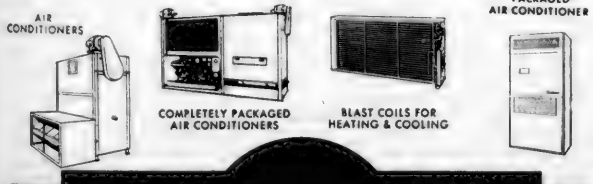
GOVERNAIR EVAPORATIVE CONDENSER

Water supply for air conditioning *can* cause you a lot of trouble. When there's a shortage; when rates are expensive or when sewage and piping are impractical—*water becomes a real headache!*

That's when engineers and contractors alike turn to Governair Evaporative Condensers!

Governair Evaporative Condensers eliminate waste-water disposal problems and pumping costs. And they're engineered to give maximum efficiency and performance at a reasonable cost. Available in sizes from 3 to 100 tons.

Choose a Governair Evaporative Condenser and there's no need for aspirin! GOVERNAIR CORPORATION, 513 N. BLACKWELDER, OKLAHOMA CITY, OKLA.



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ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS

YOUNG

UNIT HEATERS

get Dependable Power

WHEN THE HEAT'S ON . . .

reliable Doerr Motors move it where needed. Typical Doerr heater applications are shown in the cabinet heater above and in the horizontal unit below—reliable performers from the Young Radiator Company line of top quality products.

Among the many features embodied in the Doerr Motor design for heater use is the resilient mounting specifically engineered to hold the motor securely in place during shipment and in all mounting positions. The formed clips prevent axial movement in either direction, while the hooked slots in the base prevent clips from springing outward.

If you have an unusual motor problem please let us hear from you.

you get More with DOERR!

DOERR

Electric Corporation

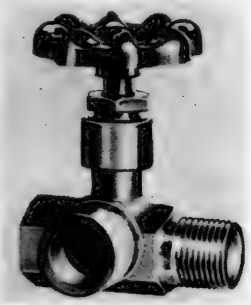
CEDARBURG, WISCONSIN

Electric Motors from 1/30 to 5 hp. Standard, or Designed to Your Specifications

(*Continued from page* 124)

Valve Has Nylon Stem-tip

The use of DuPont molded nylon in two series of water valves designed for automatic home laundries is announced by Guardian Products Corp., Michigan City, Ind. The company states that positive, no-drip, shutoff and easier opening and closing of these valves is provided by the use of a molded nylon stem-tip. Designed specifically for hot and cold water serivce, each of these valves is engineered for reduction in threaded connections.



The new No. 1800 valve provides a combination tee in the line with a through-waterway and valve-controlled threaded outlet for the hose connection.

Among other water valves available with molded nylon stem-tip is the No. 1500 Series, which is a boiler drain type unit for end-of-the-line connections of the home laundry, and the No. 1503 boiler drain for water heater drain connection applications.

More information? Circle Item 40 on postcard, page 129

New Rust-Stopping Compound

A series of tests of a new rust-stopping compound has been completed; it is being marketed by Petroleum Chemicals, Inc., Fresno, Calif.

Called Kooler-Kote, it is said to have withstood a 100 hour salt spray test in accordance with standard procedure specified by ASTE, using a 20% salt solution at 100 F. It is further stated, that at the end of the test there was no further rusting of the iron panels tested and the coating was in its original condition. A rust and corrosion test showed that the compound stopped rust on old rusted iron and prevented it on clean new panels at 125 F. A low temperature test for he applicabiliy of the coating for refrigerating pipes and coils showed no damage to the coating after normal thawing. The coating's thermal conductivity, Btu per hr per sq ft per F per inch, 32 F is 1.20. Percentage decrease in heat transfer to bare iron pipe for 1/32 inch coating was 9.4

More information? Circle Item 41 on postcard, page 129

Btu Recorder Systems

Fast, continuous measurement and control of rate-of-heat input or output is now possible through the use of the new Dynamaster Btu recorder-controller systems, announced by The Bristol Co., Waterbury, Conn. These can be used to measure and record the quantity of heat supplied to or drawn from process vessels, refrigerating plants, air conditioners, and a wide variety of other heat-exchanging devices. Control apparatus is available for regulating the temperature or flow-rate of the heat-transfer medium.

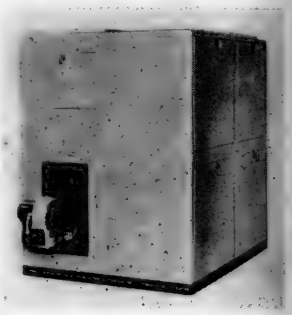
In the basic Btu recording system, one unit measures the temperature difference with two resistance thermometer bulbs and receives the flow-rate from a flow transmitter. From the two variables, it then continuously computes and records the Btu product.

Other systems are offered that provide for recording temperature difference along with Btu on a single round or strip chart by a single two-pen unit, recording of Btu and either flow-rate or temperature difference by two separate instruments. In most instances, totalizers can also be furnished with the Btu recorder to integrate the energy or heat-transfer.

More information? Circle Item 42 on postcard, page 129

Small Furnace, High Capacity

Two new industrial sized oil burning furnaces of 336,000 and 448,000 Btu per hr Bonnet output are being marketed by International Heater Co., Utica, N. Y. These models, OL-336E and OL-448E, have the advantage that the heating element is shipped with the combustion chamber already in place and is only 27 inches wide and 66 inches high, enabling it to pass thru any standard doorway.



The unit features a heavy steel pan bottom, the International Economy cabinet with slip-lock construction, reversability of the blower compartment from left to right side of the furnace, and elimination of costly combustion chamber construction. It can be connected to a very low chimney because the internal resistance is less than 0.02-inch wg.

More information? Circle Item 43 on postcard, page 129

Cooler for Warm Air Systems

A new residential and commercial air conditioner designed for use with any type of warm air furnace is in production by Union Asbestos & Rubber Co., Chicago, Ill. Known as the Unarco FAC, it is available in two and three-ton capacities.

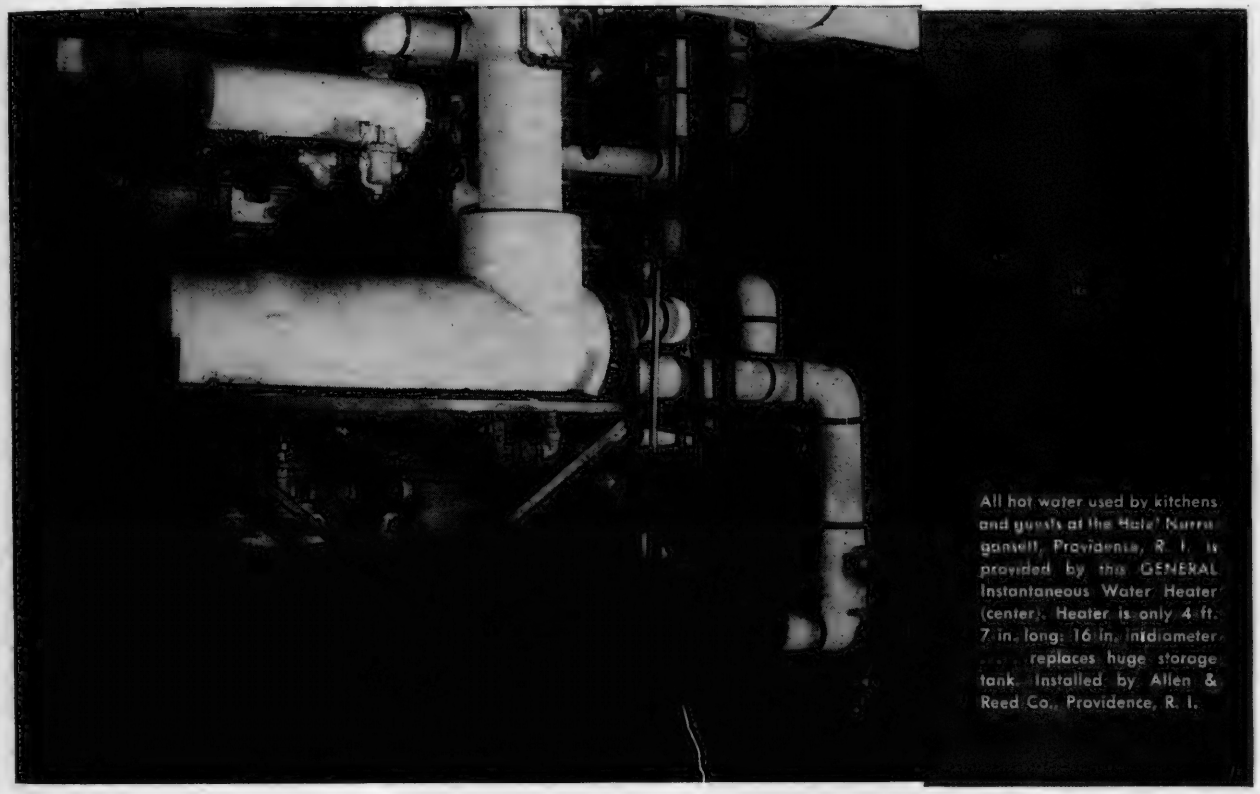
Because the new unit is designed to house its own fan, if desired, it can be used in connection with a gravity-type warm air furnace, as well as a forced-air system. It is only necessary to remove the existing floor face plates and replace them with standard air conditioning grilles.

The four-row copper cooling coil and aluminum fins permit the conditioner to be operated with low air velocity, thus insuring maximum removal of humidity. The heavily-insulated cabinet and rubber and spring mounted compressor, along with vibration eliminators installed in the refrigerant lines, provide quiet operation.

More information? Circle Item 44 on postcard, page 129

(*Continued on page* 128)

MODERNIZED HOTEL SAVES SPACE, FUEL, HEAT WITH NEW HOT WATER SYSTEM



All hot water used by kitchens and guests at the Hotel Narragansett, Providence, R. I. is provided by this GENERAL Instantaneous Water Heater (center). Heater is only 4 ft. 7 in. long; 16 in. in diameter . . . replaces huge storage tank. Installed by Allen & Reed Co., Providence, R. I.

. . . **one** GENERAL Instantaneous Heater now supplies 250 rooms – 3 large kitchens!

In recent extensive modernization activities at the Narragansett Hotel, the hot water supply wasn't overlooked. This progressive New England hotel replaced a bulky 5000 gal. storage tank with a compact modern GENERAL Instantaneous Heater. Now, this single tankless source supplies water at 180° for the kitchens and, through the use of a GENERAL Thermostatic Mixing Valve, water at 140° for guest use! What's more, the new system saves on steam consumption, wastes less heat "down the drain", and requires only a fraction of the space formerly needed. And there's always plenty of continuous hot water . . . even at peak draws.

For a diagram of this efficient GENERAL System, which includes a condensate economizer and a circulating water heater, write to GENERAL Fittings Company, Dept. L, 123 Georgia Ave., Providence 5, R. I.

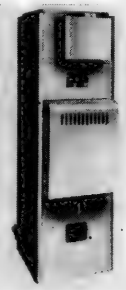
GF GENERAL FITTINGS COMPANY

TANKLESS AND INDIRECT WATER HEATERS AND HEATING SPECIALTIES

(*Continued from page* 126)

Home Winter Air Conditioner

The addition of a new model gas-fired winter air conditioner, the Budgeteer, Type SV-36-G, with capacity of 70,000 Btu per hr input is announced by Richmond Radiator Co., Metuchen, N. J. Small and compact, with all working parts accessible from the front, the new unit is designed for limited floor space installation in the smaller home.



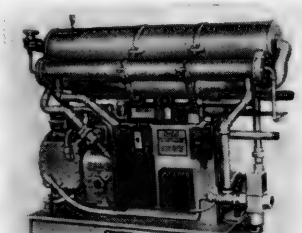
Its steel casing is Duridized to provide a bond for the light green hammertone baked-on enamel finish. The automatic unit is equipped with a low-speed blower to send a continuous flow of warm air, at any desired temperature, into each room of the home. Air passages around the heating element provide unobstructed circulation of air for the transfer of heat. The unit is insulated with heavy, corrugated asbestos with aluminum foil face to prevent heat loss through the casing. The large radiator, welded to the heating element into one unit, extracts all the heat from the hot flue gases before they enter the flue.

The new unit is approved by the A.G.A. for use with all types of gases.

More information? Circle Item 45 on postcard, page 129

New Line of Package Chillers

A new line of package chillers for chilled water air conditioning systems, drinking water or beverage cooling applications and industrial water cooling uses is announced by The Heat-X-Changer Co., Brewster, N. Y. Available in models from 2 hp through 15 hp, the new PC units are furnished completely wired, charged with Freon and factory tested, requiring only power and water connections for operation.



Condensers, chillers and heat exchangers of the new units are of patented Inner-Fin construction, permitting greater capacity with less bulk. Circulating pumps are of the non-overloading type with mechanical seals to eliminate danger of leaks, and hermetic compressors are standard on all units.

On the 10 hp and 15 hp models, two separate refrigeration systems with thermostatic controls in the water return lines to the chillers permit operation at 50% capacity when required.

More information? Circle Item 46 on postcard, page 129

New Firm Markets Dual System

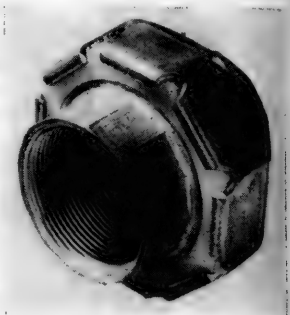
A completely automatic home air-conditioning system which permits cooling to be directed into any room of the house through unique push-button operation is being marketed by Co-Hac-Co Heating and Cooling Co., Los Angeles, Calif. The conditioner is a component of a dual heating and cooling installation being launched under the trade name, Co-Hac-Co.

The new company will offer a combination heating and cooling system designed for tract homes and modest-size individual residences. It utilizes a hot water boiler for heating and a refrigerated water chiller for cooling, the latter being made available in sizes of ½, ¾, 1, 1½, 2 and 3 tons.

More information? Circle Item 47 on postcard, page 129

New Sizes of Pipe Unions

New sizes in insulating or dielectric pipe unions, which serve as pipe unions and electric circuit breaks to stop the flow of stray electric current, are announced by Universal Controls Corp., Dallas, Tex. A full range of sizes from ½ inch to 2 inches is now offered.

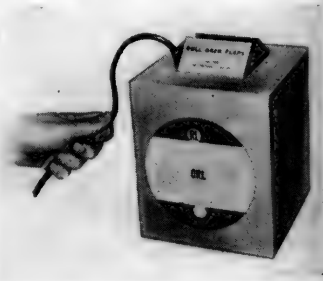


These unions afford protection against galvanic corrosion and electrolysis in piping systems where any two dissimilar metal pipes are connected. They are applicable in systems for gas water, steam and all types of fluids. The heart of the union is the insulating nut of zinc-plated steel shell containing a Du Pont Nylon core. Insulating pressure gaskets are of two types: one for water or steam, the other for gas, gasoline, oil and other fluids. Fluid never touches Nylon. Also available are a number of reducing insulating unions.

More information? Circle Item 48 on postcard, page 129

V-Belt Is Molded

New V-Belting to replace round leather belting for various industrial applications is announced by Boston Woven Hose and Rubber Co., Boston, Mass. It resists slippage, oil, and heat. In addition, the improved fabric-and-neoprene construction resists hook pull-out.



The belt is completely molded, instead of simply being cut out of large slabs of belting material. The manufacturer states that this insures a completely uniform cross section and eliminates cutting inaccuracies. The net result is better performance on the job. A 100 foot pull-out package affords ease of storage and convenience in cutting the required length for each application. Splicing is made by use of wire belt hooks.

More information? Circle Item 49 on postcard, page 129

(*Continued on page* 130)

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**

or a copy of the following

- **New Catalogs**

Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

LEAK-PROOF HOSE COUPLING—A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines, is described in a bulletin published by Titeflex, Inc., Springfield, Mass. Entitled "Titeflex Quick-Seal Coupling," the 16-page booklet describes the construction of the coupling and points out how this construction provides a sealing action which makes the coupling tighter as internal pressure increases. Also described in the bulletin are single- and double-check valve modifications of this coupling which permit disconnecting lines without shutting down pumps and prevent escape of valuable or hazardous fluids when lines are opened. ----------Item 101

THERMAL RADIOMETERS—Two types of portable radiometers are described in Form 188: one for total-hemispherical thermal radiation measurements, the other for net-exchange measurements. Both radiometers are in the Model 188 series of Beckman & Whitley, Inc., San Carlos, Calif. Cross-section drawings show the design variations between the two types. Curves are included to show response versus angle-of-incidence of radiation, and spectral reflectivity as a function of wave length. Specifications are given covering sensitivity, response time, accuracy, and similar details. ----------Item 102

ALUMINUM HEAT EXCHANGERS—Aluminum heat exchangers are the subject of Alcoa Aluminum Heat Exchanger Tubes, a booklet issued by Aluminum Company of America, Pittsburgh, Pa. Sections of the booklet report service and laboratory experinence in the use of aluminum heat exchanger tubes with cooling waters, and discuss applications of aluminum exchangers in various industries. A section on fabrication, including general design data and alloy recommendations, precedes a technical data section. Among the tables and discussions in this technical section are heat transfer, fluid flow, specifications, estimating data, and mechanical characteristics. ----------Item 103

REGENERATIVE FLY ASH COLLECTOR—A new bulletin, released by Breslove Separator Co., Pittsburgh, Pa., describes that company's regenerative fly ash collector. The bulletin contains a full description of the device, accompanied by photographs of it, installed views and a cutaway view showing the principle of operation. The operational and performance characteristics are also comprehensively discussed. ----------Item 104

CONSUMER AIR CONDITIONING BROCHURE—A newly published brochure, You Can Measure Heating Quality, is now available to interpret for the homeowner the construction and operation of a modern automatic forced warm air furnace. The 12-page booklet, published by the Janitrol Heating & Air Conditioning Div., Surface Combustion Corp., Columbus, Ohio, is lithographed in four colors and fully illustrated. A check-list of measurable qualities points out the design features that have been developed over the past 40 years. ----------Item 105

YEAR-ROUND AIR CONDITIONERS—A brochure describing Permaglas year-round air conditioners is issued by Permaglas Div., A. O. Smith Corp., Kankakee, Ill. Printed in four colors, the four-page specification sheet (Form YC-100) shows the features of the units, details the action of the modulation feature and gives capacities and dimensions. ----------Item 106

ASPHALTIC COATINGS—An eight-page booklet issued by the Insul-Mastic Corp. of America, Pittsburgh, Pa., discusses uses of coatings for rust prevention and protection. In addition to rust prevention, the booklet discusses other uses for reinforced asphaltic coatings. The booklet describes the major functions, the properties and the types of asphaltic coatings which can be used for these purposes. A selection table is included, giving the applications, catalog numbers, special features and quantities of material required for different functions of the various types of coatings. ----------Item 107

THROTTLING CONTROL VALVES—A new catalog describing its current line of throttling control valves is issued by Associated Valve and Engrg. Co., Chicago, Ill. A description of physical characteristics, service range and performance standards is contained in the catalog as well as cross-sectional views of a number of the company's valves. ----------Item 108

SHEET METAL DATA ON WALL CHART—A wall chart, Useful Data for Sheet Metal Fabricators, is available from Armco Steel Corp., Middletown, Ohio. It covers the standard sizes and estimated weights of stainless steel sheets, uncoated carbon steel sheets, stainless steel plates, Zincgrip and Zincgrip-Paintgrip steel sheets. Also included are diameters for round duots vs. rectangular ducts of equal friction, proper gages for zinc-coated rectangular ducts and exhaust systems, area of circles of given diameters, and decimal equivalents of fractions. ----------Item 109

DUST CONTROL IN WOODWORKING—A bulletin showing how wood dust can be controlled in the production of patterns, furniture, shipping, crates, pallets, and a host of other products where sawing, planing, drilling, sanding, etc., are done, is the subject of a new bulletin just published by American Wheelabrator & Equipment Corp., Mishawaka, Ind. It shows how Dustube cloth-tube-type collectors are used in industrial installations. Several illustrations describe how specific pieces of woodworking equipment are hooded and how duct work carries the dust away to the collectors. -----Item 110

EXTENDED BASEBOARD DIFFUSER—A four-page folder BD-1-54, on the new Lima extended baseboard perimeter diffuser, released by Lima Register Co., Lima, Ohio, gives full information and drawings on this latest product for heating and cooling. Included are photograph and drawing of the built-in mechanical damper, step-by-step installation drawings and complete performance data, specifications and prices. ----------Item 111

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READERS' SERVICE DEPT.

COOLING TOWERS AND DATA—A new commercial cooling tower catalog, containing new material on air-conditioning cooling tower applications, specifications, selection and installation, is issued by Halstead & Mitchell, Pittsburgh, Pa. The 16-page catalog, WT & CT-583, describes the operating characteristics of twenty of the company's standard commercial cooling towers, ranging in capacity from five through sixty tons. Several pages are devoted to tables, drawings and graphs. Information covered includes a comprehensive table of cooling tower nominal ratings for both 78 and 75 deg. wet bulb temperatures, outlet water temperature plotted against wet bulb temperature, tower capacity plotted against wet bulb temperature, layouts for year-'round operation and inside use, and much additional data. Cutaway views and line drawings detail mechanical features of the cooling tower construction. ----------Item–112

WATER COOLING CABINETS—A 4-page bulletin entitled "Country Aire Water Cooling Cabinets" is available from Lakewood Engineering & Manufacturing Co., Chicago, Ill. These cooling towers are available in sizes ranging from 3 to 64 tons capacity and said to give the most efficient water distribution system with no entering water pressure required -----Item 113

CEILING- AND FLOOR-MOUNTED CONDITIONERS—Ceiling-mounted and floor-mounted central station air conditioner units for commercial and industrial applications are the subject of Bulletin C-1100-B33B offered by Worthington Corp., Harrison, N. J. It is graphically illustrated and gives specifications, dimensions, accessories, physical data and features of the AHY (ceiling-mounted) and AVY (floor-mounted) units. ----------Item 114

MANUAL ON CLEANOUTS AND ACCESS COVERS—A 32-page manual No. 54-4 on Supremo Perfect Seal cleanouts and access covers is issued by J. A. Zurn Mfg. Co., Plumbing Div., Erie, Pa. It is designed to provide the consulting engineer and plumbing contractor with a complete reference manual on cleanouts and access covers. A section is devoted to the discussion of code requirements and the importance of preventing trouble zones by proper selection of locations for installation of cleanouts. The product section gives complete application, installation, technical diagrams and other important data on more than 30 types of cleanouts and access covers. Another feature is the detailed information on where the product should be used. ----------Item 115

FLEXIBLE DUCTING—Thermaflex, flexible lightweight ducting, designed exclusively for main line branches in both high- and low-pressure air conditioning systems, is described in a brochure prepared by Flexible Tubing Corp., Guilford, Conn. Complete engineering data sheets are included. Brochure describes construction and characteristics of the ducting which is available in a range of diameters from 2 inches through 10 inches. ------Item 116

PLUG VALVE ACTUATORS—An 8-page bulletin on plug valve actuators is released by Ledeen Mfg. Co., Los Angeles, Cal. This bulletin describes tandem type actuators for valves requiring relatively high torques to operate, and the new floating bar type actuators for use on valves requiring lower operating torques. The bulletin also shows actuator selection table, typical applications, dimensions and weights, and mountings. ---------Item 117

SOLENOID VALVES—The design and performance characteristics of its line of diaphragm operated solenoid valves is described in a new 4-page bulletin M-500, prepared by Eclipse Fuel Engineering Co., Rockford, Ill. This bulletin contains photographs, line drawings, specifications and tables. The complete line is illustrated. Cross section views show open and closed position of the valve's two moving parts. Other drawings give over-all valve dimensions. Text also covers electrical characteristics and materials of construction. Tables aid in selection of valves for various pressure ranges.----------Item 118

CLAY PIPE FOR DUCTS—A five-page bulletin on special uses of its vitrified clay pipe and Screw-Seal pipe in industrial duct installations is offered by The Robinson Clay Product Co., Akron, Ohio. Clay pipe is being used more and more widely throughout industry for waste disposal and heating, ventilating and air-conditioning ducts. They are unaffected by the corrosive action of acids, gases and all common industrial chemicals. ---------Item 119

BACKWARD CURVE BLOWER—A four-page bulletin, BC-5-54, describing its new backward curve blower is announced by the Fan and Blower Div., The Peerless Electric Co., Warren, Ohio. The bulletin describes mechanical and engineering features of the new product. The backward curve blower is manufactured in all NAFM sizes from 12½ to 36½ inches. It has self-limiting horsepower characteristics and meets all performance standards, the bulletin states. ----------Item 120

MANUFACTURER'S PICTORIAL REPORT—In a new, profusely illustrated, 28-page booklet entitled Bohn Products and How They Are Made, the Bohn Aluminum and Brass Corp., Detroit, Mich., presents the story of its manufactured products in the form of a photographic tour of the company's research and manufacturing divisions. In text and photographs, many of the manufacturing processes involved in the production of brass and aluminum forgings, bearings, pistons, castings and extrusions are interestingly treated. Typical sections of the two-color booklet highlight metallurgical research and development, production quality control, manufacturing methods and assembly operations in each of the nine divisions of the company's operations. ----------Item 121

PLASTIC VALVES—Plastic valves of unplasticized polyvinyl chloride are described in a new 2-page bulletin issued by Industrial Plastic Fabricators, Norwood, Mass. The bulletin covers both needle and globe type valves. The bulletin also describes plastic nuts and bolts, pails, dippers, and pitchers for handling of highly corrosive material. New Fluoroseal, which is a pipe compound suitable not only for use in plastic, but also metal piping is also described. ----------Item 122

NEW MODEL TRENCHER FOR PIPELINES—A new 4-page, color bulletin S-119, released by The Cleveland Trencher Co., Cleveland, Ohio, describes the company's new model 240 trencher for pipelines and miscellaneous construction. In addition to standard features, many new design and construction features are described in the bulletin, accompanied by a side-view photograph with the various features called out. The bulletin also contains a table of the available digging wheel and crawler speed combinations. Complete specifications of this model are given on the back cover. ----------Item 123

DUST COLLECTORS—A new 24-page bulletin describing its line of Uni-Wash dust collectors is released by Newcomb-Detroit Co., Detroit, Mich. The bulletin describes in detail, the junior and senior models which are used in foundries and industrial processing. Engineering data is presented, as well as dimensions and application photographs. Direct driven units and vee belt units are described, as well as automatic sludge conveyor and automatic water level control features. Data on cooling effect, evaporation and dust count is included. ----------Item 124

PLASTIC DUCTWORK—A four-page bulletin No. 1053 titled Chemical-Proof Equipment News has been made available by the Rigidon Plastic Div., Heil Process Equipment Corp., Cleveland, Ohio. The bulletin is illustrated with actual fabricated applications of their three newest products: Rigidon, a glass-reinforced plastic; Rigidin, a rigid vinyl plastic, and Rigident, a plastic of polyethelene. One application discussed in the bulletin is the use of a Rigidon solid plastic ventilating system for a steel pickling room. Item 125

ELECTRIC MOTOR LINE—A colorful new catalog, 1543, containing a brief presentation of its entire line, is released by U. S. Electrical Motors, Inc., Los Angeles, Calif. Detailed descriptions of the physical and operational characteristics, accompanied by full color photographs of each type comprise the content of the catalog. In addition, on the last page will be found curve graphs of the electrical characteristics available in the various types of motor ----------Item 126

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57			
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126				

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These Bright Spangles Attract Customers

The thousands of gleaming zinc spangles on a Bethlehem galvanized steel sheet are a powerful sales feature. The light they reflect gives this sheet a bright, clean appearance that attracts the eye.

But good appearance is only part of the story. This coating is not only attractive—it is tight, uniform, and ductile. It provides excellent protection against corrosion. And it holds securely, even after the sheet is formed or bent.

Bethlehem galvanized sheets are made from strong, durable steel, either plain or copper-bearing. They are easy to work with, and they go a long way toward helping you turn out neat, professional-looking jobs.

Bethlehem GALVANIZED Steel Sheets

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

(*Continued from page* 128)

Control Selects Temperature

Automatic and selective control of temperatures on an individual room-by-room or suite-by-suite basis can now be achieved in existing buildings with a newly developed thermostatic system introduced by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. that requires no structural changes for installation. The new system was designed for existing office buildings, apartments, hospitals and hotels.

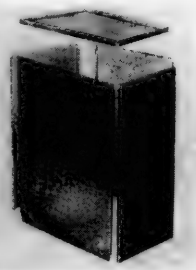
The system consists of a new motorized electric radiator valve, a small transformer and the company's new round thermostat which has a snap-on plastic cover that can be removed and painted or papered to harmonize with interior decorating themes. Installation requires no tearing up of floor or walls and can be done even without disturbing occupants. The two-position motorized valve is designed to control the flow of either low-pressure steam or hot water and is installed in place of a conventional hand radiator valve. It is connected to the wall thermostat and transformer with a few feet of inconspicuous electric wiring. Tenants simply set their thermostats for the desired temperature in the room. Each regulated radiator operates independently of all others in the building. This not only enables occupants of apartment, office, hotel or hospital rooms to dial their own comfort preference, but makes it possible to adjust the building's heating plant for such outside factors as sun exposure, shade and prevailing winds.

Although the system is fully automatic, the valve includes a manual feature which enables the users to operate the radiator even in case of power failure. The system also can be adapted to the individual console or window air conditioning units.

More information? Circle Item 50 on postcard, page 129

Plenum Chamber Added to Line

The rounding out of its line of pre-fabricated duct fittings with the addition of a plenum chamber is announced by Duc-Pac Div., Swett Bros., Inc., Springfield, Mass. It is pre-formed and features press-together construction.



The new item is available in various sizes to fit whatever furnace is used. Shipped unassembled and boxed flat to prevent denting and save space in storage, the plenums are furnished with S locks for providing a neat appearing connection to the furnace.

Other features include ease of assembly (no hammer is required), smooth edges and absence of rusting (since all cut edges are contained within the inner-lock).

More information? Circle Item 51 on postcard, page 129

Two-In-One Capacitors

Newly-designed capacitors for air conditioners, that can individually provide the power factor correction of two single capacitors of the same voltage ratings, are announced by Capacitor Dept., General Electric Co., Hudson Falls, N. Y. It is stated that the two-in-one units are generally less costly, occupy less space, weight less and require less handling than two single capacitors.

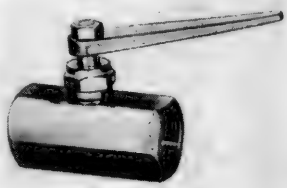
They can be applied wherever electrical circuits in air conditioners are designed for two running capacitors and a method of switching. Enclosed in solderless, drawn-oval, steel cases (some large sizes are in rectangular cases), the units are composed internally of low-loss Kraft paper and dead-soft annealed aluminum foil impregnated with Pyranol dielectric. Two types of bushing terminals are available on the dual-section capacitors: fork terminals, and quick-connect (solderless) terminals. Each unit has three bushings, one of which is common to both sections.

The capacitors are available in voltage ratings of 236, 250, 330 and 440 volts a-c with selective microfarad ratings.

More information? Circle Item 52 on postcard, page 129

Double-Seal Ball Valve

The development of a valve which is available in the same material as the pipe it is to be used on, thereby eliminating electrolytic action and corrosion is announced by Jamesbury Corp., Worcester, Mass. The manufacturer claims that the use of the double-seal ball principle incorporated in this valve has made possible the production of valves in aluminum, brass, bronze, monel, stainless and carbon steel and other wrought alloys, with seats and packings in Buna-N, neoprene, Silicone, Teflon, and Kel-F.



This line of valves features a wide choice of metals and trim. The ball-type valve is claimed to permit full, round, non-turbulent flow of media, with positive shut-off maintained under vacuum and under extreme abrasive and corrosive service conditions at 300 and 600 psi working pressures. Valve opening and closure is effected through ¼ turn of lever handle. Maintenance is small, and there is no lubrication required. The valve stem may be removed for repacking while the valve remains in the line.

Available in sizes from ¼ to 2 inches inclusive.

More information? Circle Item 53 on postcard, page 129

(*Concluded on page* 132)

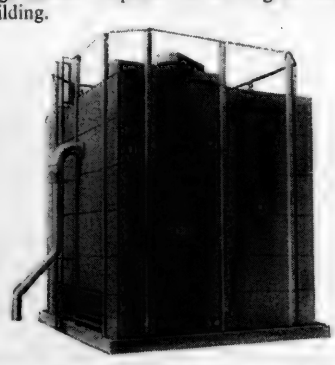
"PACKAGED" COOLING TOWERS—THE ANSWER TO LOW-COST OPERATION

The growing use of cooling towers as a part of all air conditioning systems has made it possible to produce towers by mass production methods. These "packaged" units are superior in many ways to the former custom-made towers because they are better designed and thoroughly factory-tested under varying conditions.

Above: Binks Type "H" Series—widely used for refrigeration and air conditioning. Capacities range from 4 to 40 tons.

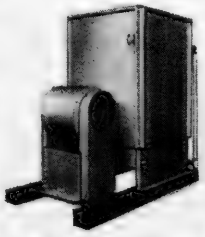
Below: Binks 3BB Series Multiple Blower Cooling Towers—Capacities range from 40 to 125 tons.

Packaged towers come in both natural and mechanical draft models...ranging from small, extra quiet towers for indoor use in residential air conditioning systems to larger towers capable of serving an entire building.



Above: Binks 2-K Series Induced Draft Cooling Towers. Capacities up to 800 tons.

Below: Binks 3-B Series Single Blower Cooling Towers. Capacities range from 5 to 36 tons.



One of the most complete lines on the market today is offered by the Binks Manufacturing Company, pioneers in this field. Binks engineers will help you select the right tower for any particular installation, upon receipt of information regarding local conditions, tonnage requirements, and cooling range required. 3120-38 Carroll Avenue, Chicago 12, Illinois.

New Residence Cooling Tower Cuts Air-Conditioning Costs

Saves 95% on cooling tower bills...today a cooling tower is a must in every air conditioning installation involving water cooled condensing units. Homes are no exception. In many communities the use of water for this purpose is restricted. In others high water rates result in excessive operating costs. A Binks Residence Cooling Tower makes it possible to cool and recirculate the condensing water...at a tremendous saving.

HERE'S WHY you will prefer Binks residential towers:

1. **Quiet operation!** Noiseless, squirrel-cage type blower supplies ample air movement at operating speeds far below the noisy propeller-type fans used in conventional cooling towers. All metal-to-metal connections are rubber cushioned. Interior surfaces are protected and soundproofed with heavy undercoating.

2. **Compact!** Fits into small space...in basement, garage, breezeway, out-doors.

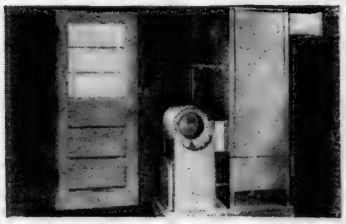
3. **Easy to install!** Comes fully assembled ready for immediate water, electric and duct connections.

4. **Low maintenance!** All metal surfaces are heavily galvanized and given several coats of good paint. Construction is rigid. Nozzles are clog-proof. No moist air reaches the air propulsion mechanism.

5. **Efficient!** Binks' 25 years experience in the development and manufacture of successful commercial towers assures correct design and high efficiency for this residence tower.

6. **Attractively priced!** These towers are mass produced for economy.

Because of their noiseless operation, Binks cooling towers can be placed in utility or recreation rooms.



Available space in garage, carport or breezeway can be used.

Send today for free Bulletins 47-B and 47-D which describe Binks Residence Cooling Towers in refrigeration capacities of 2 and 3 tons.

MAIL COUPON NOW

Binks

EVERYTHING FOR WATER COOLING

Binks Manufacturing Company
3134-38 Carroll Avenue, Chicago 12

Gentlemen: Please rush FREE Cooling Tower Bulletins 47-D and 47-B } and other facts including prices.

Name_____

Company_____

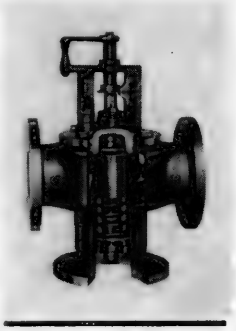
Address_____

City_____ Zone____ State_____

(*Concluded from page* 130)

New Thermal Unit on Regulator

Temperature regulators containing a new-type thermal element have been developed for use on internal combustion engines and other temperature control applications by Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville, Tenn. The new regulators are supplied with three-way valves.



Changing over from the conventional liquid or gas-filled thermal element, the new regulators (1280 and 1281) contain the company's Power-Pill unit, which is charged with a solid, wax-like compound. When subjected to heat the special wax-like compound imprisoned in the Power-Pill unit melts and expands, generating an extremely powerful force. The heated liquid returns to a solid state upon cooling.

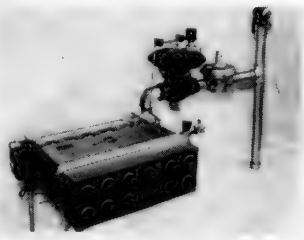
All valve bodies are fabricated from bronze with flanged ends. Other parts are brass and cadmium-plated steel. One of the new regulators is equipped with a quick-acting manual operator which can be used to override the thermal element for special situations or for emergency use to open or close the valve.

All repairs, replacements of parts, and adjustments can be made without removing the valve from the pipe line, it is stated. Temperature settings are available ranging from 120F to 190 F in 10 to 15 degree increments, and may be altered by changing Power-Pill units.

More information? Circle Item 54 on postcard, page 129

Gas Conversion Burner

A multi-venturi gas conversion burner in both the horizontal and inshot types for commercial and industrial applications is being marketed by Laharco Industries, Minneapolis, Minn.



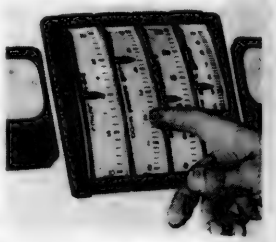
Called the series 600, the burners are cast of fine grey iron and equipped with stainless steel flame retention nozzles. Each venturi has a range of 55 to 160 cu ft of gas per tube at 3 inches water column pressure and equipped with individual primary air control. The burner is designed to operate over a wide range of gas pressures.

The burner housing box is constructed of heavy gage sheet steel, with built-in access panel for removal or inspection of venturi tubes or pilot. The burner has balanced secondary air louvres. The burner is assembled as a complete package with all controls, installation instructions and wiring diagrams.

More information? Circle Item 55 on postcard, page 129

Miniature Remote Indicator

A miniature remote indicator which has a 5 inch useable scale, but is easy to read, is now in production at The Hays Corporation, Michigan City, Ind. Features incorporated in the indicators are removable units; one-man zero adjustment; no parallax; internal illumination; and flush or semi-flush panel mountings.



These indicators can be supplied as an electric or pneumatic receiver for the measurement of any function such as pressure, draft, flow, level or temperature. The pneumatic type gage uses as its actuating element a spring-loaded metallic bellows with built-in over-pressure protection. The gages can be provided with two units in a single case and two pointers on the single scale. A direct reading gage, using a bourdon tube as the actuating element, is available for indicating pressures of fluids.

The electric model uses as its operating mechanism a specially designed motor, electronic amplifier, and a pair of differential transformers (one at the transmitter, the other at the indicator) forming an electric null balance circuit. Transmitters for pressure, draft, temperature, flow and level are offered.

More information? Circle Item 56 on postcard, page 129

Electronic Limit Controller

A companion electronic limit controller, the new 700 Series Limitrol, for the 400 Series Capacitrol is made available by Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill. The manufacturer states, that the new controller provides economical insurance against human or instrument failures which may permit overshooting of critical temperatures. It will automatically shut-off the fuel supply at any specified temperature manually set on the indicating scale and if so desired, will sound an alarm.

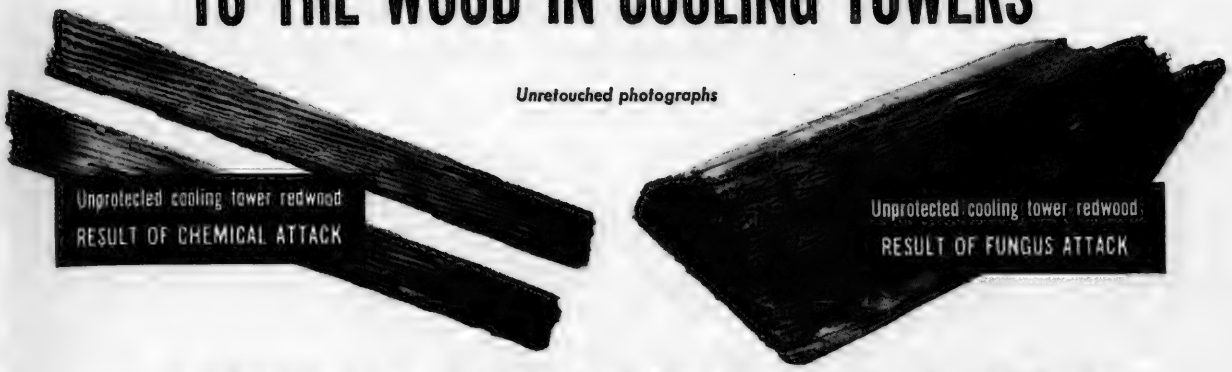
The new instrument incorporates a thermocouple break protection feature which will shut off fuel input to a process in the case of thermocouple failure or broken thermocouple connections. A two compartment, die cast case, designed for either surface or flush mounting, houses the instrument components. The case cover is of two section construction. Both black molded phenolic cover sections are fully gasketed for protection against dust and moisture.

Bulletin F 6313 is available.

More information? Circle Item 57 on postcard, page 129

LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS

Unretouched photographs


Unprotected cooling tower redwood
RESULT OF CHEMICAL ATTACK
Unprotected cooling tower redwood
RESULT OF FUNGUS ATTACK

PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS

FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING

Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

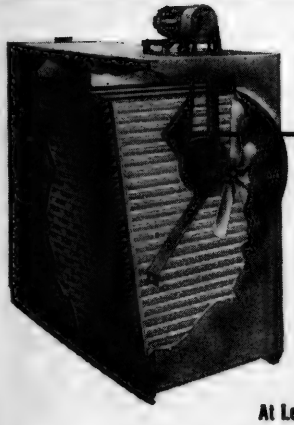
WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack



2 thru 100 Tons

Sheet-Steel Cabinets, 5-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Everdur Bolts for ease of disassembly at any time.

HM Halstead & Mitchell

At Leading Refrigeration & Heating Wholesalers Everywhere

OFFICES: Bessemer Bldg., Pittsburgh 22, Pa.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

PERSONAL comfort has always been a problem in an industrial plant, particularly where the workers are women and they perform their work while seated. Not only must the temperature and humidity range be just right but the air must be so distributed that drafts will not be created.

The question of comfort for seated workers is the problem for discussion in this issue, and the problem in full is stated in the box on this page. Should you have a problem that you would like to see discussed in this department, or if you have some comments that you would like to add to the coming discussion, you are invited to write to the Editor.

This Month's Problem

What is considered a good relative humidity to maintain in an assembly room where women are seated working with small electrical parts for an electronic unit? Is there a relative humidity range where bacteria in air might be destroyed?

This Month's Problem

It must be presumed that the small electrical parts in themselves are not particularly sensitive to relative humidity. If this were not the case, then of course the relative humidity required for the parts themselves would over-rule any other considerations. Therefore, if we assume that a specific relative humidity is not required for the parts, the problem becomes one essentially of comfort air conditioning.

In this regard, the old standard conditions of 80F and 50 per cent relative humidity would probably be considered adequate. However, in our opinion, a much better job would result if the design conditions were reduced somewhat to the order of perhaps 78F and 40 to 45 per cent relative humidity. These are definitely more comfortable working conditions and the lower relative humidity would also result in a somewhat smaller supply air quantity. This would mean that the possibility of drafts would be somewhat lessened. Drafts can be a real problem in any room where you have a large number of women who are seated for long periods of time. Also, with the lower relative humidity, there would be materially less possibility of any perspiration being transferred from the hands of the workers to the fine parts, with possible deleterious effects.

So far as we know, no work has been done or at least published, with regard to any ranges of relative humidity where bacteria in air could be destroyed, or at least retarded. However, we all are familiar with the fact that at high relative humidities, mold growth is promoted. On this experience, it would seem reasonable to assume that at very low relative humidities, mold spores and probably bacteria growth might at least be retarded. While we know of no published work in this regard, there was some work done several years ago, principally by Prof. Burgess Jennings of Northwestern Institute of Technology, with regard to the use of glycol vapors in connection with air conditioning apparatus. These were used for the control and reduction of respiratory infections, and there has been some interesting published data in this connection that can be examined.

J. E. Salmon
Carrier Corp.
Chicago, Ill.

Generally speaking, a relative humidity between 20 and 60 per cent is satisfactorily comfortable for most people. The desired optimum is probably between 40 and 50 per cent depending somewhat upon the dry bulb temperature. In the 20 to 60 per cent range, a considerable variation in relative humidity is necessary in order to be perceptible.

Some experiments have indicated that certain air-borne bacteria are destroyed when the relative humidity is kept at 50 per cent. Under favorable laboratory conditions, propylene glycol and triethylene glycol have proved highly germicidal for most air-borne bacteria when the relative humidity is between 40 and 60 per cent. In other words, a relative humidity of 50 per cent has been proved to be most healthful. When the outdoor temperature is near or below 0 F, however, the maintenance of a relative humidity of 50 per cent in the normal type of occupied space is not too practical and can cause considerable structural damage.

Dr. Lauren E. Seeley of the University of New Hampshire, conducted some experiments in the late 1930's with the desire to discover if the control of relative humidity in occupied enclosed spaces was really important.

Dr. Seeley found that most of the moisture added to

(*Concluded on page* 160)

Problem for the Next Issue

There seems to be some dispute regarding running suction lines from a fuel oil tank to a burner in an industrial plant. A fuel oil heater is used. One tank is to serve two burners. Can a common line run from the tank to serve both burners? Is there any special way of connecting the suction line to the tank?

Ultra-Modern Design

Administration and Research Center
S. C. Johnson & Son, Inc., Racine, Wis.
Architect: Frank Lloyd Wright
Consulting Mechanical Engineers:
Samuel R. Lewis & Associates

...fired by **coal**

In the famous plant of Johnson's Wax, modern equipment makes coal a clean and automatic fuel . . . and saves dollars year after year.

Says: Adrian Wilson, Power Plant Assistant Manager
S. C. Johnson & Son, Inc.
Racine, Wisconsin

"Our plant uses an average of 900 tons of coal per month. At the conclusion of a recent analysis of relative fuel costs, we were unable to justify a change from coal to any other fuel. In burning coal the modern way, we have steadily improved the efficiency of our power plant."

■

If you plan to modernize—or to build a new plant, be sure to investigate the convenience and money-saving advantages of coal when burned with modern equipment.

You can enjoy automatic operation and save on labor by installing up-to-date coal-feeding and ash-handling systems. And you can eliminate dust or smoke nuisances with such devices as dust collectors and cinder rejectors. Often such equipment can pay for itself in fuel and labor savings in only a few short years.

Get the advice of a consulting engineer. He can make a fuel analysis for you. He can advise you on what equipment can best fill your specific needs and return you a big saving year after year with coal.

YOUR BEST BUY IS BITUMINOUS

- **Today's lowest-cost fuel,** in most places, is Bituminous Coal!
- **The most stable fuel in price is coal,** because coal reserves are virtually inexhaustible . . . coal mining is highly mechanized.
- **The safest fuel to store and use** is coal.
- **Your best bet for saving dollars is coal** . . . for modern equipment greatly multiplies coal's inherent advantages.

Additional case histories, showing how other types of plants have modernized and saved money by burning coal with modern equipment, are available upon request.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

What Readers Say

Summer Degree-Days

The article "Summer Degree-Days" in the July issue of HEATING AND VENTILATING lists data to be used with the ASHVE paper, "The Operating Cost of Residential Cooling Equipment" by S. F. Gilman, L. A. Hall and E. P. Palmatier, which was presented at the recent Swampscott meeting. As co-author of this paper, I want to point out that the degree-day values in the article cannot be used to accurately predict operating costs in northern cities, and the reasoning is as follows:

It is correctly stated in the article that there are no negative degree-days, and, therefore, only days when the average temperature is above 70 degrees are considered. However, the article states that the listed degree-days were calculated from *normal* daily dry bulb temperature data *on a daily basis*. This normal daily dry bulb is the average of all mean daily temperatures occurring on a particular day over several years. Unfortunately, such normalized data essentially take negative degree-days into account.

Let's look at the situation illustrated by Table 1:

The temperatures in the second column are hypothetical values for illustrative purposes only. Note that the average for the five years is 72, and hence two degree-days are accumulated using normalized data.

The third column lists the corresponding degree-days for each year as computed by the procedure given in the original technical paper. Since negative degree-days are not considered, zeros are inserted for the years when the temperatures were 60 and 70. The sum is 30 and the average is six degree-days, or *three times* the result obtained by the normalized weather data.

Why don't these agree? The reason is that in obtaining the normal temperature of 72 (second column), the two 60 degree values are included. Since they are less than the 70 deg base for computing degree-days, use of the result of 72 in the degree-day computation is the same as considering negative degree-days; but negative degree-days are specifically excluded in our paper. The important point is that normalized weather data can only be used when all temperatures are 70 deg or above. Consider the hypothetical data in Table 2.

Here we get an answer of 15 degree-days from normalized weather data as well as from the average of the degree-days for the three years. It can easily be shown

TABLE 1

Date	Mean Daily Dry-Bulb Temp, Deg F		Degree-Days Above 70F
July 1, 1910	60		0
July 1, 1920	90		20
July 1, 1930	70		0
July 1, 1940	80		10
July 1, 1950	60		0
Sum	360	Sum	30
Average	72		
Degree-Days	2	Average	6

TABLE 2

Date	Mean Daily Dry-Bulb Temp Deg F		Degree-Days Above 70F
August 1, 1930	85		15
August 1, 1940	90		20
August 1, 1950	80		10
Sum	255	Sum	45
Average	85		
Degree-Days	15	Average	15

that the two procedures will always yield identical results when all temperatures are 70 deg or more. It follows that during the hot months in the south, normalized weather data will yield accurate values of degree-days for predicting operating costs. Therefore, the values given in the article for cities below about 35 deg north latitude can be expected to be quite accurate.

Above 35 deg latitude, the listed values will be increasingly too low as one travels north. For example, the degree-day data we have worked up indicates the value of 440 for Washington, D. C., should be closer to 500; the value of 255 for New York City should be 440; and the value of 6 for Buffalo should be about 210. As a general statement, I would say that all values below 150 normal degree-days are probably very considerably too low.

The general procedure for calculating degree-days is to subtract 70 from all mean daily temperatures above 70 over a particular year's weather data and sum them up. The process is then repeated for other years. The average of the totals is then a representative value for normal summer weather. It is this value which must be used in the equations given in our paper. The so-called normal degree-days listed in the July issue of HEATING AND VENTILATING, by essentially considering negative as well as positive degree-days, will yield predicted operating costs which will be considerably lower than the actual in many cities in the northern latitudes.

Stanley F. Gilman
Research Section Head
Carrier Corp.,
Syracuse N. Y.

Air Conditioning in Large Buildings

EDITOR, HEATING AND VENTILATING:

The article "Future of Air Conditioning in Large Buildings" by J. W. Kreuttner in your July, 1954 issue is most interesting, especially coming from a man with such a wide and intimate knowledge of the subject. While I cannot speak with equal authority, not being engaged directly in that field and more concerned with steam heating, yet I have had ample opportunity to study plans and actual buildings, and of course, I can read what is published on the subject. From my own study I, too, feel that present day air conditioning systems are too costly

(*Continued on page* 154)

air conditioning ducts

. . . installed in a matter of minutes *with*

DRIVE-IT SYSTEM

SPLIT SECOND FASTENINGS TO CONCRETE OR STEEL

Air Conditioning on the new Hotel Algiers in Miami, Fla., was speeded by use of Drive-it Fastening Tools.

Fastening overhead installation even in cramped conduit tunnels easy for new Drive-it 320.

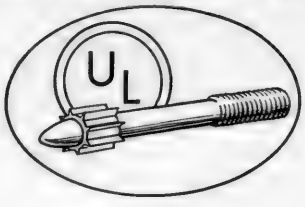
NEW EXCLUSIVE

DRIVE-IT 320

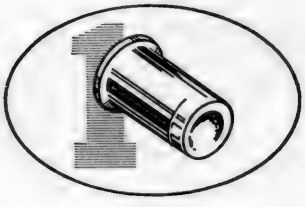
WITH

BREAK-OPEN ACTION

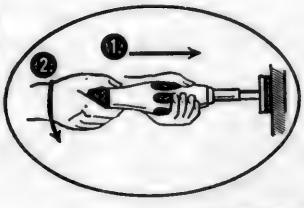
Snap open action results in the fastest operating tool on the market. Easiest method to load and eject cartridges under any condition.



Drive pins are Underwriters' Laboratories approved.



Controlled Power. First and only tool which requires but one standard power load regardless of penetration desired. No need to buy and stock various strength power loads.



Three-way Safety. Cannot be discharged accidentally, due to the push and turn firing sequence. This, plus the large, swivel safety pad, makes DRIVE-IT triple safe.

More fastenings per hour with this speedy way of loading and ejecting cartridges.

DRIVE-IT

the original **POWDER-ACTUATED TOOL**

SEND THIS COUPON FOR FULL DETAILS

POWDER POWER TOOL CORP.

Dept. 2, 7526 S.W. Macadam Ave., Portland 1, Ore.

Canada: Ammo Power Tool Co., Ltd.
735 Broadway, Vancouver, B. C.

☐ Please send FREE catalogue and literature.

☐ I want a FREE demonstration of *DRIVE-IT*.

Name_____

Street_____

City_____ State_____

PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Biggest Diner is Air Cooled

PROBLEM: Diner operators William and Louis Ramundo and Florian Walchak of Bloomfield, N. J., decided to replace a diner which they had operated for years by building a new, larger unit. The huge new diner was to be air conditioned and capable of serving 100,000 customers a month.

SOLUTION: A stainless steel $250,000 diner was erected at State and Liberty Streets. Heart of the air conditioning system is a 25-ton Servel DUT water chiller. Said to be the largest ever installed in a diner, the system was installed by Moran and Company of Bloomfield, with engineering assistance from Cooling Equipment Distributors, Servel air conditioning distributor for Northern New Jersey. The water chiller is operated by steam supplied from a gas-fired boiler located in the full size basement which also houses a complete bakery as well as gas water heaters. The diner was built by the Fodero Diner Car Company of Bloomfield. It is said to be the largest single diner unit built by one manufacturer and took 8 months work from start to finish. It is 115 feet long and contains 6500 square feet of floor space.

RESULTS: The world's biggest diner will use gas not only to feed its potential 100,000 customers a month but also to keep them cool in the summer as well as warm in the winter.

Filters on Space Heaters Cut Costs

PROBLEM: The maintenance of space heaters in the Timken Roller Bearing Company shop areas had presented a difficult and expensive problem. Heavy coats of both oil and dust were deposited on the various parts of the space heater, creating a serious maintenance and cleaning problem. Three or four times each year, and at a cost of around $75.00 per cleaning per heater, each heater was dismantled and cleaned with steam.

SOLUTION: This expensive and time-consuming maintenance problem has been solved by installing a permanent impingement type air filter at the back of each space heater. Housed in a sheet metal box, two impingement filters were installed in the housing affixed to the back of the heater. The two filters can be removed periodically, placed in a washer, and in a matter of minutes, reinstalled in the sheet metal housing. The tedious, expensive task of dismantling and cleaning each space heater has thus been eliminated.

RESULTS: Total cost for the sheet metal housing, the filters, and the time required to install them is figured at $125 per heater. One hundred such installations have been made at the Canton and Gambrinus plants of The Timken Roller Bearing Company. The filter installations will pay for themselves in less than a year as a result of the marked reduction in required maintenance.

A similar filter installation has been made on the flues and smoke stacks in The Timken Roller Bearing Company's roller hardening department. In that department carbon particles and oil were deposited in the ducts and smoke stacks creating a potentially dangerous fire hazard. Annually a maintenance crew would laboriously clean each duct and each smoke stack. The new filter installations will not only eliminate the necessity of cleaning these stacks each year, but also will greatly improve the safety factor in that department.

---

140 Units Cool Courthouse

PROBLEM: Summer conditions in Memphis, Tennessee, required that the old Shelby County Courthouse be air conditioned. The building was originally wired in 1910 and although the electric load has doubled several times since, the proposed air conditioning would increase the load by the largest amount to date.

SOLUTION: A total of 140 one-horsepower Remington window air conditioners have been installed, 24 in the city treasurer's and the county offices and 116 additional for other parts of the building. Rewiring to take care of the air conditioning is costing more than $100,000. The window units are mounted high above head level through holes cut in panels that cover the entire top parts of the windows.

RESULTS: With the new wiring system and multiple unit air conditioning, juries are able to deliberate comfortably in summer heat waves. Operating costs are held at a minimum through flexibility of the system.

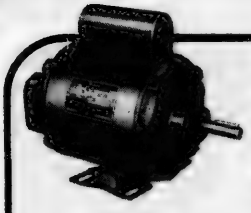
Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

for single-phase motor applications Wagner Type RK is the Right Kind of motor to use...

Wagner capacitor-start induction motors are the *right kind* of motors to use for most single-phase applications. They have become first choice of many leading manufacturers of air conditioners, refrigerators, freezers, water pumps, and motor-driven tools, and are used in many other similar fractional or integral horsepower applications.

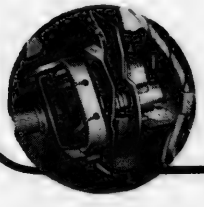
These motors offer low maintenance cost—only a minimum of servicing is required—and they give many years of reliable service with unusual freedom from vibration and noise.

Pictured above is the Wagner Type RK, resilient-mounted capacitor-start induction motor in the new 56 frame that is used for ⅓, ½ and ¾ hp ratings. Smaller fractional ratings, and integral sizes from 1 through 5 hp, are also available.



Wagner rigid base Type RK motor, in the new 56 frame size. The formed steel base is securely welded to the rolled steel frame to produce a strong, rigid mount that will not get out of alignment.

Frames for these motors are made of thick rolled steel, with machined beads which accurately position the end plates. The frames have no openings, and are treated inside and out to prevent rusting.



These motors are equipped with the Wagner quick-break switch that disconnects the starting winding and capacitor from the line when the motor approaches operating speed. It operates over a million times without trouble.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
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BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

H54-15

Locomotives Heat Naval Station

PROBLEM: At the Oceana Naval Air Station near Norfolk, Va., Captain W. S. Butts learned that the heating plant planned for the station would be delayed.

SOLUTION: Two surplus steam locomotives were arranged in tandem on a siding with steam jackets connected to the heating plant piping system. Since a locomotive depends on forward speed to provide draft for its boiler, Captain Butts had his temporary power plant rigged with a DeBothezat induced draft Bifurcator fan on the stack.

RESULTS: The novel arrangement of a fan makes up for the lack of natural draft. The air station reports that this temporary plant will serve adequately until January when the planned heating system will be operating.

Modern Heaters Replace Stoves

PROBLEM: At the Overhead Door Co., woodworking plant in Lewistown, Pa., a number of wood and coal-burning stoves at various positions about the plant created such a fire hazard that the company was required to maintain a 7-day, 24-hour watchman service. Production changes required that the stoves be moved from time to time with the result that flue pipes became extended and stoves were located on valuable floor space, never quite out of the way.

SOLUTION: When the company decided to install a sprinkler system, a new look was taken at the heating system. The company installed a 750,000 Btu per hr Dravo Counterflo oil fired warm air space heater in the metal-working area of the plant. Operation proved so satisfactory that the following year a number of Dravo Paraflo space heaters were installed. Each of these units has a capacity of 250,000 Btu per hr and is located in little-used space along the walls of the plant. Units are capable of projecting a blanket of warm air over the central portion of the shop, and some of the units located near large doorways are actuated by thermostats whenever the doors are opened.

RESULTS: A 25% reduction in fire insurance premiums, 10% more floor space, and elimination of the continuous watchman service are tangible results of the installation. Production lines are now set up for straight-through operation as compared to the former method of working around the stoves. Wear and tear on the machine motors has been reduced. Machines are no longer stiff and difficult to start as they were when the oil was chilled from overnight shut-down of the stoves. Furthermore, warm starting means lower power demand, a factor that has had considerable effect on monthly power bills. Working conditions have been improved both from the standpoint of comfort and the convenience of a cleaner and neater plant.

Drying a Water Filtration Plant

PROBLEM: In the pipe galleries of Chicago's South District Filtration Plant, said to be the largest in the world, the relative humidity remained at a constant 98% resulting in excessive condensation on pipes through which cool Lake Michigan water flowed. Everything from floor to ceiling was covered with moisture and a light mist hung in the air. Corrosion of delicate control equipment was a serious problem. Paint lifted off metal surfaces. No maintenance work could be performed for any length of time in the cold damp atmosphere.

SOLUTION: Kathabar dehumidification equipment manufactured by Surface Combustion Corporation of Toledo, was installed. Two units deliver 35,000 cfm of dehumidified air at from 40 to 72 F and 45 to 55% RH. A third unit serves a large pump room.

RESULTS: The new dry atmosphere has checked corrosion, reduced equipment failure, cut maintenance time and expense. Working conditions are greatly improved.

Heat Pumps Serve Desert Arcade Shops

PROBLEM: Shops in the newly opened Arcade Building in Lancaster, Calif., are subjected to blistering desert temperatures in summer and a winter design temperature of about 25 F.

SOLUTION: Each of the shops is provided with a Philco Thermo Cool room air conditioner designed to heat the same size room it cools. The problem of limited floor space was solved by installing the air conditioners in a special opening provided over each doorway.

RESULTS: During cold weather in this desert community, the air conditioners provide complete heating comfort. In the spring and fall, the air conditioners are used on the heating cycle in the morning and for warm afternoons are switched to either fan or to cooling. Operation is reported to be completely satisfactory under temperature conditions ranging from 25 F to 110F with hot or cooled conditioned air provided to the stores as needed.

3 Years Prove This Valve Right

for this gritty caustic service for instance

The Installation

On Trucleen dry cleaning machine, product of the American Laundry Machinery Co., Cincinnati, using Crane Diaphragm Valves as standard specification on 100° F. strong soap solution drain lines.

Valve Service Ratings

SUITABILITY: Outperforms all valves tried

FEATURES: Sealed-to-fluid bonnet

MAINTENANCE COST: None

SERVICE LIFE: No replacements since adopted 3 years ago

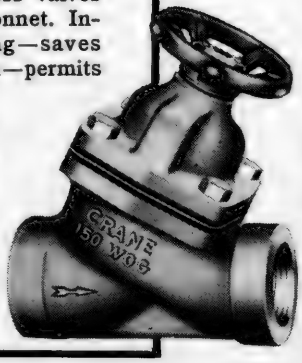
OPERATING RESULTS: Better machine operation—more satisfied users

PRICE: No premium

AVAILABILITY: Catalog item—No. 1610

The Valve

The diaphragm in Crane packless valves does one job only—sealing the bonnet. Independent disc does the seating—saves wear and tear on the diaphragm—permits closure of the valve even should diaphragm fail. Choose these valves from wide variety of body and trim materials—including linings—for corrosive, erosive, and ordinary services. Full information in new booklet; ask your Crane Representative for a copy.



The Case History

Conventional valves were previously used. Not until Crane Diaphragm Valves were tried was their designed-in superiority for this service fully realized. Working parts of the formerly used valves were constantly exposed to the effects of the gritty sediment solution. Seats, stem, even packing were subject to accelerated wear. The soapy solution would settle and build up in the bonnet.

Not so with No. 1610 Crane Diaphragm Valves. Their bonnet and working parts are completely sealed to line fluid. Their pliable Neoprene disc insert absorbs and seats tightly on foreign matter that quickly damages conventional valves.

Standard equipment on Trucleen machines now for more than three years, Crane Diaphragm Valves show this record: not one bit of trouble . . . no leaks . . . no repairs . . . they're absolutely right for the job—at a no-premium price.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

NEWS OF THE MONTH

AIR CONDITIONED VILLAGE

constructed to demonstrate how homes can be economically designed with year round air conditioning

A full-scale demonstration center for year-'round residential air conditioning will be a group of homes built to test products of twenty-two air conditioning manufacturers and some thirty other makers of building products. The twenty-two home village, in Austin, Texas, is being sponsored by the National Association of Home Builders, the Air Conditioning and Refrigeration Institute, the National Warm Air Heating and Air Conditioning Association and the University of Texas at Austin, who will make an intensive year-long study of cooling and heating to prove that residential air conditioning need no longer be considered a luxury.

• **SPARKPLUG.**—The know-how of hundreds of experienced home builders, engineers, architects, economists, government officials and other skilled citizens from all over the country have gone into the construction of these homes. Sparkplug behind the Air Conditioned Village is 36-year old Ned Cole, Austin architect, chairman of the NAHB sub-committee on residential air conditioning, and project manager of the Austin program.

• **PROGRAM.**— Each of the 22-residences was built by an independent local builder at a maximum cost of $12,000, less land, and each with two tons of installed refrigeration. Each builder sold its house to a local family, with the understanding that the houses were to be tested and observed over a period of one year. Each of the homes is a little different in orientation, method of construction, materials and shading devices in order to demonstrate the relative effect of each of these on the amount of cooling required. Various tests and studies will be made in connection with the project to answer such questions as whether filtered air at controlled temperatures reduces the frequency of colds and relieves hay fever sufferers and victims of other allergies, precisely how much it costs to operate a year-round air conditioning system, and what effect various building materials have on the efficiency of the system, what the heat gain and loss factors of different colored paints used on the air conditioned home are, what colors and textures provide the best roofing surface, and what the effect of shading devices like awnings and curtains on room temperatures is. Besides the work of a group of engineering specialists under the direction of Dean W. R. Woolrich, the University of Texas has a group making a study of the physical health and mental attitudes of the families living in the research village. The FHA and Veterans Administration are studying the project to obtain accurate cost data for future mortgage appraisals. It is expected that a great many interests in a variety of fields will benefit from the results of the project as well as setting a precedent for similar projects in other localities.

• **SELECTION OF SITE.**—Austin, Texas, was selected as the site for this first experimental village because of a number of satisfactory conditions for such a national experiment. Climatically, Austin was most suitable as a proving ground for year-'round air conditioning, since it presents a summer condition of a hot, dry climate, and a winter condition varying from a cold dry, to a warm humid condition.

Officials Earl G. Smith, Leonard Haeger, Andrew Patton, and R. G. Hughes in the demonstration home air conditioned by Carrier Corp.

HIGH SCHOOL HEATING SYSTEM

designed for continuous expansion of one of the nation's most unusual high school operations.

A $160,000 heating system has now completed its first full year of operating in the $2,500,000 Carlmont High School, Belmont, California. Recognized as one of the nation's largest, newest, and most unusual high school operations, visitors have been attracted from many foreign countries including Germany, England, and Japan. Of major interest in the Carlmont institution is the combination of careful planning, the accuracy of installation, and the anticipation of future heating requirements.

• **RAPID EXPANSION.**—Four hundred and fifty students were transferred into this new high school when it opened in April, 1953. Within a year, the enrollment had jumped to 750. In September of 1954, students from three other school districts are being transferred to Carlmont, bringing its enrollment well over 1,400. Plans are now underway for another construction project at Carlmont to give it a 2,000-student capacity.

• **FARSIGHTED DESIGN.**—Architect Frank Wynkoop, in designing the school, knew he had to build for continued future expansion. Statistics indicated that there will be twice as many boys and girls of highschool age in 1958 as there were in 1952. He therefore planned a heating plant capable of supporting tomorrow's needs. The engineering was done by H. H. Harris of San Francisco. In the 50- by 30-foot boiler room they installed two National Commercial Steel Boilers. Each boiler has a SBI

(*Continued on page* 144)

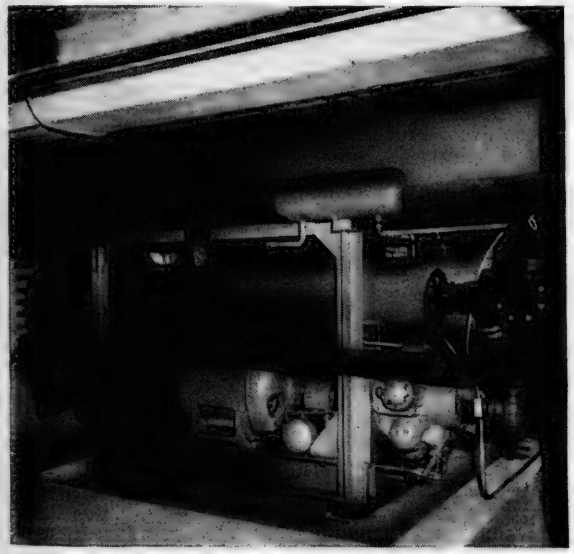
ZONE CONTROL
of indoor climate
REQUIRED . . .

PROVIDED
economically
with CHRYSLER AIRTEMP

CENTRAL STATION
AIR CONDITIONING

Engineers: Sasnett & Bennett, Miami;
Levy & O'Keef, New York City.
Gen. Contractor: Robert L. Turchin.
Mechanical Contractor:
Markowitz Bros., Inc.

Ainsley Building,
Miami, Florida.
Owner: Herman Greenfeld.
Architect: Morris Lapidus.



Four 125 H.P. Chrysler Airtemp "Packaged" Liquid Chillers supply chilled water for cooling which is pumped to air handling units on each floor. Chrysler Airtemp Variable-Capacity Radial Compressors feature exclusive weight-saving, space-saving design. Perfect balance reduces noise and vibration—no special foundations required!

Professional and commercial offices of many types in the Ainsley Building in Miami made zone climate control on every floor a primary requisite in planning the year 'round air conditioning. And economy of installation and operation dictated a central station system. So the air conditioning was engineered to fit! Chrysler Airtemp central station equipment supplies chilled water for cooling and warm water for heating to air handling units. Every zone on every floor has individual control.

Whether the particular requirements of a building make one system or a specially-engineered combination of air conditioning systems the most practical choice, Chrysler Airtemp has the answer. A complete line of equipment for *every* air conditioning need is produced in Chrysler Airtemp's windowless, air conditioned plant. And through a wholly-owned subsidiary, Airtemp Construction Corporation, architects, engineers and contractors get a complete air conditioning service. Just write to Airtemp Division, Chrysler Corporation, Dept. HV, 1600 Webster Street, Dayton 1, Ohio.

CHRYSLER AIRTEMP

HEATING • AIR CONDITIONING for HOMES, BUSINESS, INDUSTRY

AIRTEMP DIVISION, CHRYSLER CORPORATION
Dayton 1, Ohio

HIGH SCHOOL HEATING SYSTEM

(*Continued from page* 142)

Carlmont High School, showing the 275 foot commercial subjects wing.

net steam rating of 25,000 sq ft, equivalent to 6,000,000 Btu per hr. The boilers were oversize for 1953, but plans were already progressing for additional heat load. Low pressure steam boilers were specified to facilitate cross-connecting another boiler or twin boiler installation at the opposite end of the school buildings when future enlargement of the institution produces more heat load than is presently in plans.

• **HEAT DISTRIBUTION.**—The school now has about 155,000 sq ft of floor area in ten buildings on a 30-acre plot of ground. Mains, the largest of which is 6 inches, distribute steam through underground piping to the various buildings. Each of the ten buildings has a heat exchanger to convert steam to hot water for heating. The heat distribuion medium throughout the school is eight miles of ¾-inch wrought iron pipe fabricated into sinuous coils and embedded in the concrete floor.

• **FUEL.**—Installed in the two boilers are combination natural gas and fuel oil burners. This type of burner was required, as the local gas utility provides gas on an interruptible basis, since such a large gas delivery is difficult to meet during peak load periods. Natural gas has been used most of the time since April, 1953 by Carlmont, but it can quickly change to oil in emergency periods. School officials report that during the first heating season, fuel costs averaged only $500 a month.

COOLING EQUIPMENT SALES

show increase in totals of units shipped and dollar values for 1953.

In 1953, the value of manufacturers shipments of components and accessories for air conditioning and refrigeration equipment amounted to $293 million, according to the Bureau of the Census, Department of Commerce.

Table I.—AIR-CONDITIONING AND REFRIGERATION EQUIPMENT

Quantity and Value of Shipments, by Class of Product, 1952-1953

(Value figures in thousands of dollars)

Class of product	1953		1952	
	Number	Value	Number	Value
Condensing units, total	966,136	$74,013	654,223	$61,439
Ammonia refrigerants	158	214	209	300
Refrigerants (except ammonia), total	965,978	73,799	654,014	61,139
Air-cooled	920,947	55,958	616,215	47,359
Water-cooled	45,031	17,841	37,799	13,780
Compressors and compressor units, total	2,380,739	121,054	1,677,300	71,047
Ammonia refrigerants	2,251	5,952	1,825	4,708
Refrigerants (except ammonia)	2,378,488	115,102	1,675,475	66,339
Heat-exchanger equipment, total	....	82,602	....	63,666
Evaporative condensers	5,508	8,647	4,873	7,179
Air-conditioning units (not self-contained)	59,682	18,918	43,399	14,344
Unit coolers, refrigeration	89,532	13,489	75,854	11,111
Other heat-exchanger equipment	....	41,548	....	31,032
Self-contained air-conditioning units, total	1,137,293	293,644	438,464	135,579
Window-sill type	1,017,699	191,129	372,064	70,323
Other than window-sill type	119,594	102,515	66,400	65,256
Other air-conditioning and refrigeration equipment, total	....	61,567	....	41,898
Centrifugal refrigeration systems	469	14,970	363	14,040
Ice-making machines	28,228	14,385	26,693	12,838
Refrigeration chassis for air-conditioning	20,363	10,298	6,396	2,706
Year-round air-conditioning units (self-contained, except heat pumps)	12,862	12,148	4,077	4,170
Heat pumps	986	1,613	....	...
Mechanical dehumidifiers, refrigeration type	90,551	6,151	89,152	6,431
Absorption and absorption systems and equipment	213	2,002	119	1,713

Shipments of condensing units in 1953 totaled 966 thousand, valued at $74 million, compared with 654 thousand units valued at $61 million shipped in 1952. A total of 2,380,739 compressors and compressor units valued at $121 million, were shipped in 1953, representing an increase of 42% in number and 70% in value over 1952 shipments. The value of heat-exchanger equipment

(*Continued on page* 146)

REPLACE rust-clogged pipes WITH COPPER

You can do your next replacement job easier, better . . . and *faster,* by using Chase Type K Soft Temper Copper Water Tube.

Chase Type K Soft Temper Copper Water Tube works easily through small openings, around corners . . . from an easy-to-handle coil. In replacement installations, there's no need to rip out whole walls. You simply fit Chase Copper Water Tube right alongside the old pipe!

Because Chase Copper Water Tube is available in coils up to 100 feet in length, you reduce the number of joints and save the cost of many fittings.

For replacement jobs—or brand new installations—use the water tube that can *never* clog with rust—Chase Copper Water Tube.

Contact your Wholesaler for Chase Soft Temper or Hard Temper Copper Water Tube and a complete line of Chase Copper Tube Fittings.

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Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

COOLING EQUIPMENT SALES

(*Continued from page* 144)

shipped in 1953 was $83 million, an increase of 30% from the previous year's total of $64 million. Shipments of centrifugal refrigeration systems increased from 363 units in 1952 to 469 units in 1953.

• **UNITARY EQUIPMENT.**—Shipments of self-contained air-conditioning units totaled 1,137,293 valued at $294 million, representing increases of 159% and 117%, respectively, over the quantity and value of units shipped in 1952. Shipments of room air-conditioners (1½ hp and under, including window sill type) amounted to 1,044,691 units valued at $199 million in 1953, representing an increase of 175% in the number of units and 169% in value over 1952. During 1953, shipments of 986 heat pumps were reported, valued at $1.6 million. The year 1953 was the first year for which separate shipments data are published for refrigeration chassis for air conditioning. These shipments totaled 20,363 units valued at $10 million.

Table 1 presents a summary of the quantity and value of shipments of air conditioning and refrigeration equipment by class of product for 1952 and 1953.

• **SCOPE OF REPORT.**—The figures on quantity and value of shipments in the Bureau report represent completed sales of equipment, *i.e.*, units actually billed and shipped. Complete units delivered on consignment or shipped to a branch warehouse for stock are not included until such time as they are actually sold. The dollar values shown are the manufacturers net billing prices, f.o.b. factory.

Bureau release M52A-03 presents data for all known companies manufacturing components and accessories for air conditioning and commercial refrigeration and complete air conditioning equipment of the types specified. The 1953 figures are based on reports received from 129 companies. Any inquiries concerning these data should be addressed to the Bureau of the Census, Industry Division, Machinery and Equipment Section, Washington, D. C.

ASHVE-ASRE COMMITTEE

on cooperation appointed by the presidents of the two societies.

To coordinate more closely and minimize the possibility of having overlapping activities, a Joint Committee on Cooperation consisting of five representatives each, from the American Society of Heating and Ventilating Engineers and the American Society of Refrigerating Engineers has been appointed by the presidents of the two Societies.

• **PERSONNEL ANNOUNCED.**—L. N. Hunter, Johnstown, Pa., and Arthur J. Hess, Los Angeles, announced the committee personnel as follows: Merrill F. Blankin, Phila.; Peter B. Gordon, New York; John E. Haines, Minneapolis; Everett N. McDonnell, Chicago; and Prof. Elmer R. Queer, State College, Pa., representing ASHVE; and, Frank A. Faust, Bloomfield, N. J.; Prof. Carl F. Kayan, James Larkin, John F. Stone and Nathan N. Wolpert all of New York, representing ASRE. The following officers were elected at the organization meeting of the Committee in the Engineers Club in New York: Chairman, F. H. Faust, ASRE; Vice Chairman, E. N. McDonnell, ASHVE; Secretary, M. C. Turpin, ASRE.

• **OBJECTIVES OUTLINED.**—As this meeting the Chairman outlined the committee's objectives and there was a thorough discussion of the functions of the two societies, including overlapping membership, scope and methods of operation, publications, research, and other activities.

• **SUB-COMMITTEES APPOINTED.**—To divide the work of making a comprehensive survey of the respective fields of interest, operations, and services, and to provide material for discussion and recommendations by the committee, the following five sub-committees were appointed: Research and Technical Services, including codes and standards, Peter B. Gordon and John F. Stone; Publications, Guide, Data Book and Periodicals, Nathan N. Wolpert and Everett N. McDonnell; Membership Analysis respecting interests and overlapping, Prof. Carl F. Kayan and John E. Haines; Meetings, Merrill F. Blankin and James Larkin; and Financial Analysis, Frank H. Faust and Prof. Elmer R. Queer.

Reports will be made at the next meeting of the committee, scheduled to be held in New York, late in September.

MIDYEAR REVIEW

of construction contract awards shows manufacturing awards down, schools up.

In a mid-year report, G. C. Smith, economist of F. W. Dodge Corp., states that construction contract awards in the 37 eastern states totalled nine and a quarter billion dollars in the first six months of 1954, showing a 17% increase over the totals for the same period last year.

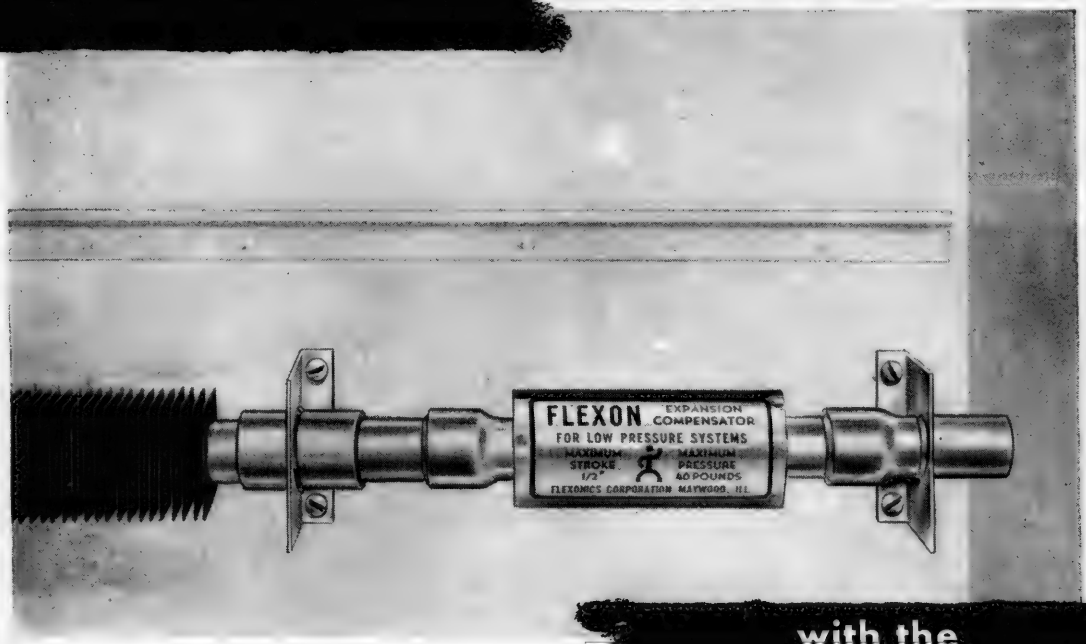
• **MANUFACTURING.**—Within the manufacturing category there were wide variations, with declines characterizing those industries which expanded most during the Korean War, and increases in many consumer goods industries. Awards in this category in the first half of 1954 totalled $584 million, down 22% below the same period last year. However, Mr. Smith states, that much of this decline is accounted for by the fact that large atomic energy contracts were let in the first half of 1953, and if these were eliminated, the decline in contract awards for manufacturing facilities would show only a 9% decline, actually reflecting a net gain.

• **COMMERCIAL.**—Mr. Smith states that awards for commercial construction in the first half of 1954 totalled $890 million, or 34% above last year, which was the previous all-time high in this category, and that this rise more than off-sets the decline in manufacturing.

(*Continued on page* 148)

STOP

expansion leakage and pipe creeping noises in steam and hot water heating systems



with the NEW FLEXON EXPANSION COMPENSATOR

DESIGN DETAILS

The Flexon Expansion Compensator consists of a two ply phosphor bronze bellows with copper tube end connections (sizes ¾" to 1¼") enclosed in a floating protective shroud of brass. All joints are electronically sealed with silver solder for long leak-proof life. The 2" size has standard threaded fittings. Threaded fittings for other sizes are also available. A single compensator will handle total piping motion up to ⅝" (½" in compression, ⅛" in extension). Suitable for temperatures from —60° F. to 250° F. and for pressures up to 40 psig.

Now, for the first time, there is a practical, economical answer to the problem of expansion control in low pressure steam and hot water heating systems—the new FLEXON Expansion Compensator. It is especially designed and manufactured for finned type convectors, baseboard, radiator or heating supply lines. The FLEXON Expansion Compensator absorbs thermal expansion and puts an end to the danger of leakage that often results from the stresses set up by uncontrolled expansion. At the same time it eliminates the pipe creeping noises that frequently accompany expansion. Important, too, is the fact that FLEXON Expansion Compensators are made to outlast the building in which they are installed. There is no maintenance . . . just put them in and forget them.

FLEXON Expansion Compensators are made in ¾", 1", 1¼" and 2" sizes. Contact your local distributor for further information, or use the coupon below to get the descriptive bulletin.

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Flexon identifies products of Flexonics Corporation that have served industry for over 52 years.

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Flexonics Corporation
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Maywood, Ill.

Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

Name .....

Company .....

Address .....

City ..... Zone .... State .....

My Wholesaler is: .....

MIDYEAR REVIEW

(*Continued from page* 146)

• **RESIDENTIAL.**— A striking feature of the residential awards, according to Mr. Smith, was the great increase in emphasis on single family homes at the expense of multi-family housing. Contract awards in this category totalled $3.98 billion in the first half of 1954, 22% above the like period for last year. The report states that this large rise was accounted for primarily by an increase in awards for one-family dwellings constructed for sale or rent. Awards for apartment construction continued the steady decline which has shown up each year since a 1951 peak in this category, and awards for two-family dwellings made up a very small part of the total.

• **SCHOOLS.**—Awards for school and college buildings in the first six months of 1954 totalled $936 million, a new record for the six month period, and 29% above the first half of last year.

• **HOSPITALS.**— Contract awards for hospital construction reversed a three year decline and jumped 54% above last year. The total of $232 million was still well below the peak reached in the first half of 1950, however.

• **CHURCHES.**—The great growth in construction of churches and other religious buildings is reflected in an almost unbroken increase in contract awards since World War II. The total of $222 million in the first half of 1954 is 28% above the same period of last year.

• **PUBLIC WORKS.**—Awards for public works totalled $1.37 billion in the first half of 1954, up 11% from the first six month of last year.

• **UTILITIES.**—Contract awards for the construction of public and private utilities in the first six months of 1954 totalled $496 million, well below the record set in the first half of 1952, but 6% above the first half of last year.

• **TRENDS.**—On the basis of the report, Mr. Smith believes the following trends have been established: (a) continued strength of residential construction, well beyond the expectations of most forecasters, and a strong trend toward construction of single-family homes at the expense of multi-family housing; (b) a sharp drop in awards for construction of manufacturing facilities, which is more than offset by a sizeable increase in the commercial category, so that these two groups show an actual net increase; (c) continued growth of the importance of schools as a major factor in the construction boom; (d) high level of construction activity in the remainder of 1954; and (e) an upswing in other industries as a result of construction activity.

GOVERNORS MEET

to adopt resolution concerning fuel requirements in the event of war.

The Governor's Permanent Fuel Conference met at Lake George, N. Y. recently for the second time, where they deliberated at length on the problems incident to fueling the nation's military and civilian requirements in the event of all-out war. The Permanent Conference is headed by Governors Fine of Pennsylvania, Chairman, Marland of West Virginia, Vice Chairman, and Stratton of Illinois, Secretary. Governors Lausche of Ohio, Wetherby of Kentucky, Craig of Indiana, Murray of Oklahoma, together with Marland and Stratton, comprise the executive committee. The governors of Alabama, Colorado, Kansas, Missouri, North Dakota, Tennessee, Utah, Virginia and Wyoming are the other members. The conference first met in Washington on April 26, and formed its permanent organization on April 28.

• **WW II RECALLED.**—Recalling that in World War II, fuel users faced varying degrees of rationing, depending upon the fuel involved, the conference questioned what forms of rationing would result from a sudden increase in demand for domestic production of all fuels on the one hand, and the shutting off of foreign sources on the other. The problem is all the more poignant in the face of the current tense far eastern situation, the apparent uncertainty of negotiations in Geneva, and the troubled affairs in the Caribbean area.

• **RESOLUTION ADOPTED.**—Calling for action by the senate, already authorized under the extension of the original Myers Bill, the conference adopted a resolution urging the Chairman of the Senate Committee on Interior and Insular Affairs to promptly revive an investigation started in 1951 into available fuel and energy resources except atomic energy.

VENTILATION CONFERENCE

designed to increase interest in industrial exhaust systems held this month.

A three-day Industrial Ventilation Conference, sponsored jointly by the New York State Labor Department's Division of Industrial Hygiene, and Columbia University, will be held at the University's Pupin Hall, New York City, on September 15th, 16th and 17th, 1954.

• **OBJECTIVES.**—Designed to increase knowledge of industrial exhaust systems which comply with the New York State Industrial Codes, the conference is also expected to stimulate interest in, and appreciation of the economy of, well-designed systems.

The intensive three-day program will include lectures by personnel from the medical and chemical units of the Department's Industrial Hygiene Division, to provide a complete picture of the industrial hygiene problem.

Main emphasis, however, will be on exhaust system design. Basic engineering lectures on the subject will be given by experts of the engineering unit of the D.I.H. Classroom problems will offer the relatively inexperienced, as well as the advanced designer, increased knowledge of the science.

(*Continued on page* 150)

TAILORING GLASS FIBERS FOR THE Roll-O-MATIC!

Roll-O-MATIC
Automatic Renewable Media Air Filter

New Media Makes Possible Today's Most Maintenance-Free Air Filter

THEY'RE stretching glass—just one of the many steps involved in its conversion to an efficient, low cost filtering media for the new ROLL-O-MATIC. In final form, it consists of a thick "blanket" of bonded glass fibers possessing the cleaning efficiency, dust holding capacity and high velocity rating of a viscous filtering media, yet a material that can be made in lengths up to 70 feet and is sufficiently resilient and flexible to permit packaging in compact 13" diameter rolls.

With the development of this versatile media, the mechanics of ROLL-O-MATIC design were easy. Mounted in roll form at top of filter, the media moves as a continuous curtain down the face of the ROLL-O-MATIC, and is rerolled on a driven spool at bottom. Movement of media is controlled by an automatic time switch which introduces sufficient clean material into air stream to maintain the desired operating resistance.

What's the end result of all this for the user? Continuous, high efficiency cleaning at an operating cost less than half that of a disposable type filter of equal capacity! For complete facts, contact your local AAF representative or write for ROLL-O-MATIC Bulletin No. 248.

AAF

American Air Filter
COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 294 Central Avenue, Louisville 8, Kentucky

VENTILATION CONFERENCE

(*Continued from page* 148)

• **PARTICIPANTS.**—Among those participating in the conference are: John R. Dunning, dean, School of Engineering, Columbia University; Professor Carl F. Kayan, executive officer, Department of Mechanical Engineering; Deputy Industrial Commissioner Edward J. Nyegaard, New York State Department of Labor; Dr. Irving Tabershaw, director of the Division of Industrial Hygiene; Charles S. Leopold, consulting engineer; and Dr. Leonard Greenburg, commissioner, New York City Department of Air Pollution Control.

MORE EFFECTIVE PRACTICES

in design, construction seen as result of current Defense Dept. study.

Sounder military design and construction practices are expected to result from a series of studies currently being undertaken under the direction of Assistant Secretary of Defense (Properties and Installations) Franklin G. Floete, the Department of Defense announced last month.

• **SEVEN REVIEWS.**—Three of seven reviews, assigned to engineer consultants with broad experience in the various fields, already have been completed. The others are expected to be completed soon. In addition, other military construction practices may be similarly reviewed. Purpose of this review of design criteria and military construction practices of the three military services is to evaluate the adequacy and effectiveness of present practices, determine variations among the services, provide comparison with accepted commercial practice and recommend appropriate corrective measures.

• **COMPLETED STUDIES.**—Studies recently completed and consultants submitting them are:

Electrical distribution systems, emergency generating facilities and stand-by power practices, by C. Warren Bogan, Consulting Engineer, Washington, D. C.;

Water Supply Policies, by Earnest Boyce, Chairman, Department of Civil Engineering, University of Michigan;

Air Conditioning for Hospitals, by Thomas H. Urdahl, Consulting Engineer, Washington, D. C. A Department of Defense Instruction incorporating the recommendations of this study already has been issued.

• **PROJECTED STUDIES.**—Studies which are yet to be completed include:

Sewage Practices by Harold Thomas, Jr., Harvard University, Cambridge, Massachusetts;

Fire Protection Policies, by John J. Ahern, Director, Department of Fire Protection and Safety Engineering, Illinois Institute of Technology, Chicago, Illinois;

Two additional studies, requiring more detailed research, are being performed by architect-engineer firms. Giffels and Vallet, Detroit, Michigan, are conducting a review of warehouses and warehousing facilities. Parsons, Brinckerhoff, Hall and Macdonald, New York City, have started a study of airfields and airfield facilities.

ASHVE MEETING

held at Massachusetts shore discusses latest heating and air conditioning developments.

With a near record registration of 568 members and guests, the 1954 semi-annual meeting of the American Society of Heating and Ventilating Engineers held at the New Ocean House in Swampscott, Mass., June 28-30 was claimed to be an outstanding success.

• **DISCUSSIONS.**—Fourteen papers were presented at four technical sessions. There were papers discussing physiological responses of obese, hypothyroid, and hyperthyroid patients to sudden environmental changes, a thermal conductivity meter, and irradiation of ground and building walls by sky radiation. Other papers covered characteristics of downward jets, studies on temperature and velocity in vertical jets, noise and vibration in piping systems, filtration of microorganisms by glass fiber, performance data on panel heating and cooling systems, and cooling load from sunlit glass and wall. At the final session papers on the cooling of a residence, the operating cost of a residential cooling system and an analogue analysis of residential cooling loads were presented.

The semi-annual banquet featured an address by the Rev. Lex King Souter of the First Congregational Church, Fall River, Mass. Presentation of the Past President's Memory Book was made to past president Reg. F. Taylor, Houston, Tex. Sunday morning 130 members embarked for an all day trip to Provincetown.

GAS CLEANING

to come under scrutiny of industry committee on equipment performance standards.

Performance standards of effluent air and gas cleaning equipment was announced as subject for a new project to be undertaken by a national committee of representatives of all organizations concerned. The committee will operate under procedures of the American Standards Association.

• **INTERESTED GROUPS.**—The following groups have shown interest in this project for an American Standard: Air Pollution Control Association, American Conference of Governmental Industrial Hygienists, American Electroplaters Association, American Foundryman's Society, American Industrial Hygiene Association, American Petroleum Institute, American Public Health Association, American Society of Heating and Ventilating Engineers, American Society of Mechanical Engineers, American Society of Safety Engineers, American Society for Testing Materials, Automobile Manufacturers Association, Electric Light and Power Group, Foundry Equipment Manufacturers. Association, National Association of Mutual Casualty Companies, National Bureau of Standards, National Research Council, National Safety Council, Navy Department—Bureau of Ships, and Society of

(*Continued on page* 152)

BARBER COLMAN

"UNI-FLO" ENGINEERED

Air Distribution

...for no smudge on acoustical ceilings!

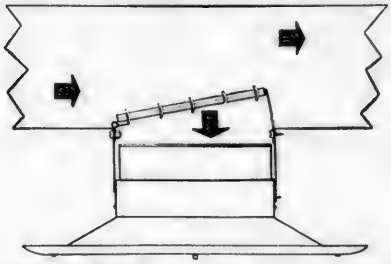
It's a big order to get draft-free, engineered air distribution . . . from inconspicuous diffusers which harmonize with acoustical ceiling designs . . . without signs of smudging or streaking adjoining acoustical blocks! Yet that's the experience record with Uni-Flo Rectangular Ceiling Diffusers after a full year's operation in the First Wisconsin National Bank Building, Milwaukee. It's the same story everywhere. Find out how you can rid your building of the cleaning expense and disturbing appearance of smudged ceilings . . . call your nearby Barber-Colman Field Office or write us.

Architect and Building Manager: Edwin J. Kraus. *Consulting Engineers and Air Conditioning Contractors:* Hoye Heating Co. *Sheet Metal Contractors:* Louis Hoffman Co., all of Milwaukee.

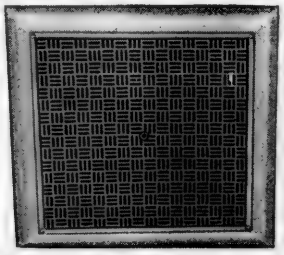
(Above) **First National Bank Building,** Milwaukee, another building in which Uni-Flo equipment eliminated smudged ceiling problem.

(Left) **Uni-Flo Diffusers** are barely distinguishable. In this unretouched photograph, taken after a year's operation, note the clean, streak-free appearance of acoustical blocks adjoining diffusers.

Uni-Flo Rectangular Ceiling Diffusers (recessed model) can be attached to standard T-bar in acoustical ceilings. Surface models are used on any type ceiling.

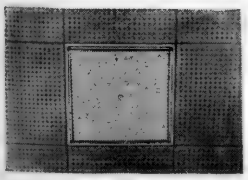


Uni-Flo Deflectrols reduce turning losses and provide balanced air distribution. Installed behind diffusers or in an approach duct at the juncture with the trunk duct.



Uni-Flo Square Ceiling Diffusers are also available. Like the rectangular diffuser, the square type can be furnished in recessed or surface models.

BLAZING THE TRAIL *TO BETTER AIR DISTRIBUTION*



First with diffusers to match acoustical ceilings

Establishment of extensive laboratory facilities and publishing of reliable data on air distribution led Barber-Colman engineers into investigations of many problems facing the industry. Solutions of those problems required numerous product developments. Among them was the introduction of square ceiling diffusers specially designed to harmonize with increasingly popular acoustical ceilings. Not only did this pioneering achievement provide satisfactory air distribution, but the diffusers eliminated troublesome smudging of adjoining acoustical blocks. Dust and dirt deposits are limited to the face of the diffuser, where they are easily removable. Immediate acceptance of the square type led to the development of the rectangular type. Send for literature kit giving complete details on both types.

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On all Jobs...this instrument is invaluable for balancing hot water heating systems, reading floor, wall or ceiling temperatures, checking refrigerated coils, insulation and all other low temperature surfaces.

Quick Accuracy...the 2300 assures the highest standards of speed, accuracy and dependability—you can read most low surface temperatures in 3 to 5 seconds.

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GAS CLEANING

(*Continued from page* 150)

Automotive Engineers.

• **SPONSORS.**—The ASME and ASHVE were approved by the Safety Standards Board of ASA as possible sponsors.

GAS HOUSEHEATING

forecasts reflect steady increase of 1.2 million customers in each of next three years.

Approximately 1.2 million additional families will heat with gas during each of the next three years, according to estimates by the American Gas Association. These forecasts exceed slightly the estimates for comparable period of time submitted by the utility industry one year ago. This gain reflects improved gas supplies, substantial easing of restrictions on new heating installations, and continued advantageous relationships with competitive fuels in most areas.

New gas househeating installations during 1953 aggregated 1.2 million, according to AGA Bureau of Statistics. This raised the total number of homes heated with utility gas at the end of the year to 12.9 million, equivalent to 50.9% of all residential gas consumers. Of more significance is the fact that existing gas heating customers represent 61.3% of all residential gas users considered to be part of the currently existing potential market for gas househeating.

• **RESTRICTIONS.**—As of the end of 1953, there were 88 utility companies, serving 9.1 million residential customers, or 36% of all households served by the industry, which still had restrictions of some kind in effect on new heating installations. One year earlier a total of 120 companies, serving 10.2 million families, were under restrictions. Increased supplies of gas and significantly expanded underground storage facilities are expected to reduce the restricted areas still further in the near future.

The most significant increase in anticipated new heating customers will occur in the East North Central area, principally in Illinois and Michigan. Additional supplies of gas in that area will permit a total of 990 thousand new heating customers to be served during the next three seasons. New connections for gas househeating will reach nearly 400 thousand in the third year.

From a percentage standpoint the most rapid growth is anticipated in New England. The connection of an estimated 133 thousand new heating customers by the end of 1956 will more than double the number of such customers served by the industry in that area at the present time.

• **BASIS.**—Data shown in the AGA survey represent industry totals based on reports received from 278 utilities serving 92% of the residential gas customers in the country. Utilities were requested to indicate the potential for gas househeating among their existing residential users.

Many such customers occupy units in multi-family

(*Concluded on page* 154)

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THE BIG NAME IN SMALL MOTORS

Offers Manufacturers—

The latest developments in electric motor design. Smooth-running motors built for long life . . . with outstanding Tri-Flux and Uni-Cast features.

A wide selection of motors in sizes from 1/500 to 1/6 h.p., and blowers from 50 to 280 CFM.

25 years of experience, specializing in efficient motor design while making no end product to compete with its customers.

Let a Redmond Sales Engineer help you select the right motor for your application. Write today for information.

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You Can Have DRY Air with EXACT Moisture Control

for your comfort, for your process, for testing machines or materials at any time of the year

Niagara Air Conditioning provides you with any temperature and relative humidity you need, held constant or varied at will. Using "Hygrol" absorbent, you save the refrigeration commonly used to condense moisture and make reheat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment.

This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. Humidity control is a separate function from heating or cooling.

This gives you precise control over your air conditions with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control air conditioning installations have the best record for reliability.

Write for information on the application to your problem. Ask for descriptive Bulletins #112 and #121. Address Dept. HV

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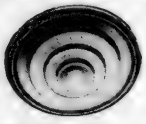
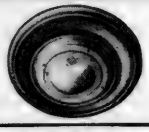
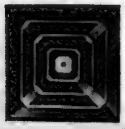
AIR DISTRIBUTION CARNES

in style, quality and economy

Yes, Carnes leads with a line of diffusers that's way ahead! The best ideas and newest developments . . . beautiful styling . . . easy installation . . . complete adjustability are all incorporated to bring you top quality at low prices. Your best bet is Carnes!

A DIFFUSER FOR EVERY REQUIREMENT

MODEL		NECK SIZES	C F M OUTPUT	
E-1	Supply only fixed cone	5 to 32	50 to 13,400	
E	Supply only fixed cone	5 to 32	50 to 13,400	
EJ	Supply only adjustable cone			
ER	Supply and return fixed cone			
BR	Supply only adjustable cones	6 to 32	115 to 13,400	
BRS	Supply and return adjustable cones			
EH	Half Round supply only fixed cone	6 to 20	50 to 2,725	
QSL	Combination diffuser and lighting fixture adjustable	8 to 17	210 to 2,670	
SFS	Supply only surface type fixed cone			
SFR	Supply only recessed type fixed cone	8 x 8 to 20 x 20	150 to 6,925	

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The Most Talked About Name in Air Distribution

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GAS HOUSECLEANING

(*Continued from page* 152)

structures served by one central heating unit which is physically not adaptable to gas heating. Some occupy dwelling units where even the most favorable prospective gas price would be disadvantageous. Data relating to potential heating customers reflect these two limiting factors. Furthermore such data exclude the potential market to be created by new construction in the future and by initiation of gas service in existing housing not currently using gas for any purpose.

What Readers Say

(*Continued from page* 136)

both in equipment and space occupied, and too complicated. I'm sure that there can and will be extensive changes in design in the next few years.

There are two schemes, other than those suggested by Mr. Kreuttner, which appeal to me.

1. A radiant or panel heating and cooling system. This is being tried, with what success I do not know, but the idea has appeal because it seems to be based on the very logical argument—stop the heat from getting into the building as far as possible, rather than removing it after it has gotten in.

2. One or more self-contained compressor units in each room or space, taking fresh air in and exhausting moisture of condensation through openings in the wall. Unless the heat pump can be adapted to this use, a separate heating system is needed, either steam or hot water. This scheme provides complete individual control summer and winter, with individual air circulation, which makes it especially attractive to apartment houses. These units would be much like the present window type but built to stand vertically to get shallow depth, and recessed into the walls, with ducts and grilles through the wall at each unit. A heating element can be incorporated into the unit. Replacement of the compressor can be made a simple matter, and in this connection it should be remembered that they run only a fraction of the hours per year that a household refrigerator runs.

The first cost of the second scheme, if all factors are taken into consideration, should be less than present day systems. Operation and maintenance might not be less but labor would be cheaper because licensed engineers are not required.

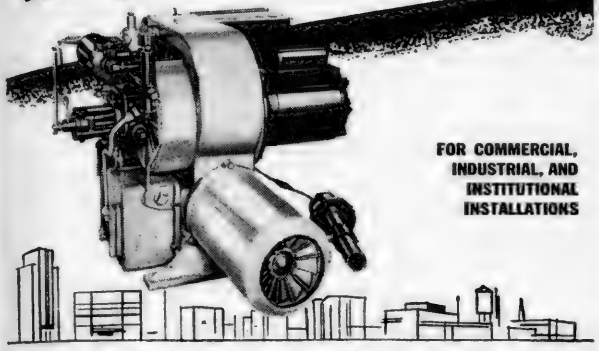
In apartment houses space could be rented with and without air conditioning. Tenants who go away all summer, or those who don't like air conditioning anyway, need not pay for it.

The most serious objection that I have heard to these self contained units is that in big cities the screens and filters clog rapidly and need frequent cleaning or replacing. But there are developments in electronic filters which may take care of this.

Finally, I am puzzled by the excessive use of windows on the new office buildings, at least in New York City,

(*Concluded on page* 156)

Hev-E-Oil Burner keeps heat cheap!



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Use heavy fuel oils *costing 30% less per gallon*

Cheap heat is smart economy! That's why thousands of owners are converting to Hev-E-Oil Burners and using *commercial* No. 4 or 5 heavy oils, costing 3 to 6¢ *less* per gallon than domestic light oils. Owners not only pocket the difference in cash, but get 7% more heat per gallon as well.

Hev-E-Oil Burners are specifically designed for heating buildings requiring more than 6,000 gallons of oil or 45 tons of coal per year.

Conversion is simple. The Hev-E-Oil fits all types of standard heating boilers and change-over takes only a few hours' time. Reports on file show fuel savings pay for conversion in a season or two.

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- Flame size set exactly to furnace capacity
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- Six sizes: 1 to 60 gph
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- As simple to install as a domestic burner
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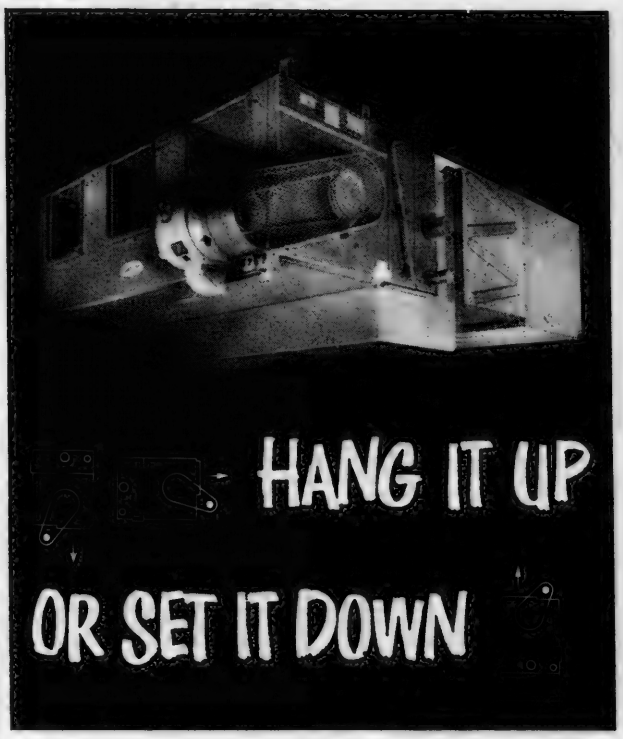

CARRIER HEATING AND VENTILATING UNITS

are almost "as versatile as a one-man band." They can be horizontally suspended, vertically suspended, or floor mounted . . . in schools, auditoriums, gymnasiums, garages, mills, factories and other large-area buildings.

Sectionalized construction affords ease of installation. Flexibility in selection and applications. Right- or left-hand assembly. Horizontal, upward or downward air discharge.

And that isn't all: Carrier Heating and Ventilating Units can be used with or without ductwork. Multiple discharge outlets permit air distribution where needed, under all conditions of full or partial loads. Air temperature is always under positive control.

Flat or V-type filter sections may be chosen. Mixing sections can be incorporated in a variety of arrangements. Heating coils are available in a wide selection—for steam or hot water. Face and by-pass dampers are interconnected for ready control of heated air and by-pass air.

Other features, inbuilt or optional, testify further to the ingenuity of Carrier engineering. To the quality of Carrier manufacture. And to the dependable performance of these widely acclaimed units. Capacities range from 1500 to 30,000 cfm.

For complete list of features and selection data, WRITE to Carrier Corporation, Syracuse, New York.

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REFRIGERATION
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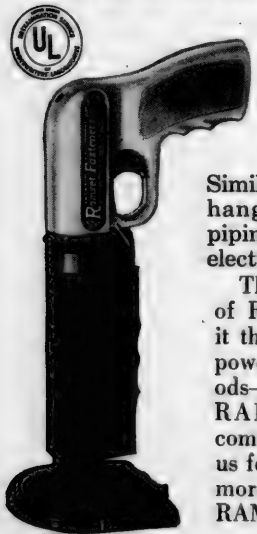
Ramset FASTENING SYSTEM **SAVES $11,000**

for Fastening Air Ducts in Texas' Largest Store

More than two miles of air conditioning ducts were installed with RAMSET SYSTEM in the new addition to Joske's Department Store at San Antonio, Texas, the "largest store in the largest state."

By using RAMSET Jobmaster, anchoring studs were set at the rate of better than 1 per minute, instead of an estimated 15 minutes each by old-fashioned, conventional methods. Substantial cost savings were thus gained, as well as a far faster, completely secure installation. Similar results were obtained for hanging 13 miles of sprinkler piping and anchoring 43 miles of electric conduit.



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FIRST IN POWDER ACTUATED FASTENING — AN Olin PRODUCT

What Readers Say

(*Concluded from page* 154)

and what is worse, the use of ordinary glass. It may be true that these continuous windows have tenant appeal, but once in, the tenants lower the Venetian blinds to shut out the glare and to keep from feeling as if they were in a bird cage. If such windows are considered essential, then at least they should be made of special glass designed for low heat transmission. As it is, the heat gain must be excessive, which means abnormal cost of power.

Lewis Smith

New York, N. Y.

H.M.Y. Britannia

EDITOR, HEATING AND VENTILATING:

I have read with interest your article in the August "London Letter" on the Royal Yacht *Britannia,* and as it is our company who handled the air conditioning of this ship we are disappointed that no mention has been made of this fact in the write-up. Thermotank Limited, our parent company in Scotland, has been established since the beginning of the century, the air conditioning of the *Britannia* being but one illustration of its interesting and varied history, and we are very proud of the company's reputation in a great many countries throughout the world. . . .

Hugh P. Walker
Executive Vice President
Thermotank, Inc.

Detroit, Mich.

London Letter

(*Concluded from page* 108)

for the railroad station and catching a train South, when suddenly the sun was shining, and the cause had at least to be investigated. The radiation was not enough to be at all unpleasant on a hatless head, and if the intensity can be adjusted to keep sidewalks dry in a moderate snowfall there should be a future for this idea which must be far cheaper to install than pipes below the surface. It has certainly dealt with Newcastle's snow quite effectively.

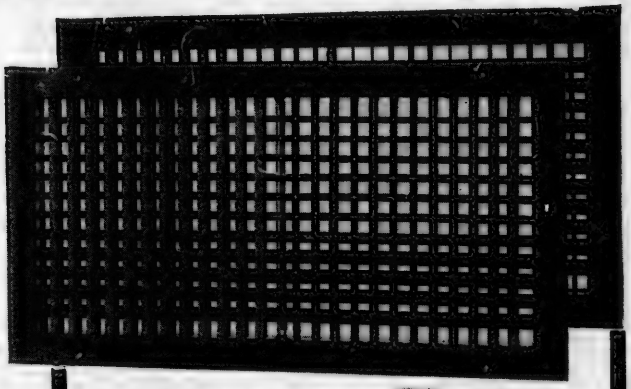
One Newcastle firm has already decided to install such heaters beneath its sidewalk canopies, a combination which will undoubtedly produce comfort for window-shoppers, and other suggestions include queues for sports stadiums and cinemas. The advantage of radiant heating for such applications is, of course, that it is unaffected by air movements. The cost is so low that the price of one cinema seat would pay for warming a long queue for an hour.

Experiments to establish the best system are continuing and heaters of a modified design and with a boosted air supply are now being tested by the Gas Board. One advantage of this so-called summer is that it has enabled these investigations to be continued up to the time of writing.

See This Sensational New Heating & Ventilating

GRILLE WITH DETACHABLE VOLUME CONTROL!

- **Increased Directional Control**
- **Eliminates Possibility of Tampering or Accidental Changes**
- **Meters Air-flow Accurately**

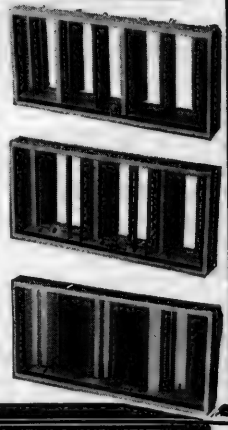


A-J

New features never before available . . . increased directional control, tamper-proof regulating, unmatched beauty, rugged strength and extreme ease of installation.
Extruded aluminum vanes are individually adjustable. Their unique shape provides greater directional control, and reduces air resistance to a minimum. This means more accurate balancing.
Each vane individually controlled. Operates under spring-loaded tension, eliminating any possibility of deflection pattern being altered by accident or tampering.
Fully-enclosed, wrap-around frame makes grille sturdier, assures easier, safer installation. Entire mechanism is concealed eliminating possibility of "air leaks."
Series "400" A-J Grilles (with or without volume control) available in any size. Choice of vertical or horizontal louvers only—or combination of both, with either louver in front. Both sets of louvers adjustable without removing grille. Available in prime coat, hammered bronze or metallic gray or any standard finish.

NEW DETACHABLE VOLUME CONTROL

Easy to operate. Accurately meters air-flow from a "Whisper" to a "Full Blast"! A volume control you can depend on! Meters the flow accurately at every stage — from fully closed to fully open. No "dead spots". Louvers move simultaneously in opposing directions. Gear-driven action. System may be balanced without removing outer grille. Available with grille, or can be quickly installed later.



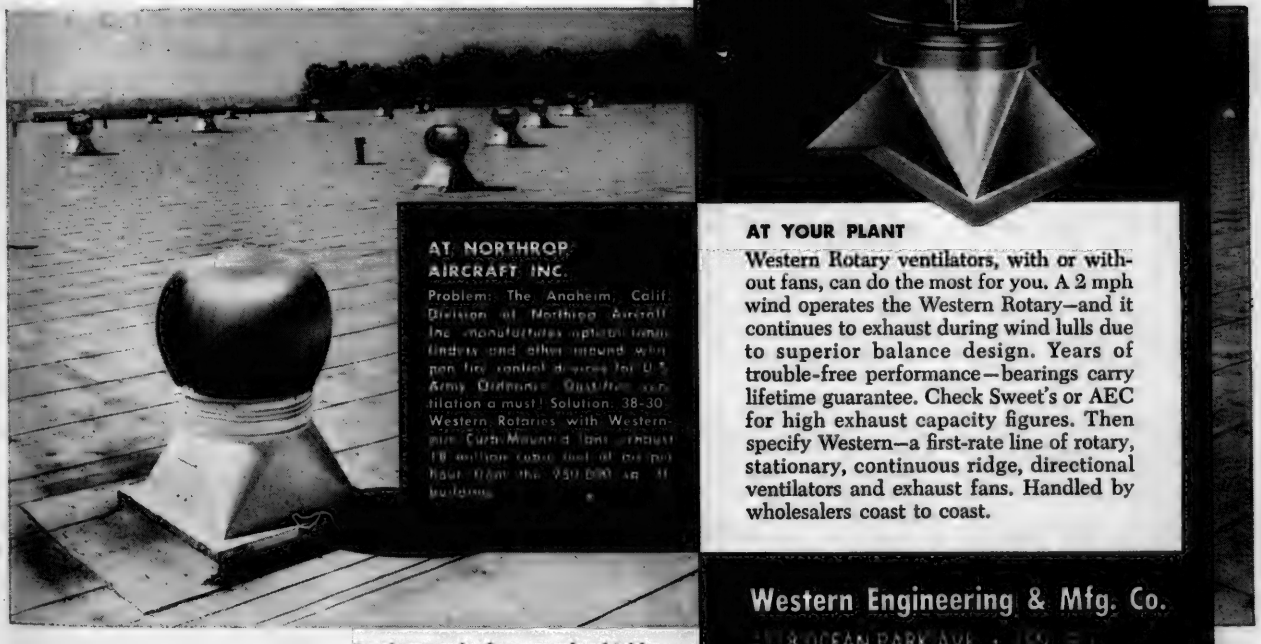
For More Information—Call or Write

A-J MANUFACTURING CO.

2119 Washington St., Dept. V9, Kansas City 8, Mo.

MATCHING RETURN AIR GRILLES AVAILABLE

Where the problem is ventilation — the solution is a WESTERN SYSTEM



AT NORTHROP AIRCRAFT INC.

Problem: The Anaheim, Calif. Division of Northrop Aircraft Inc. manufactures optical range finders and other ground weapon fire control devices for U. S. Army Ordnance. Ventilation a must! Solution: 38-30 Western Rotaries with Western-pire Curb-Mounted Cans exhaust 78 million cubic feet of air per hour from the 750,000 sq. ft. buildings.

AT YOUR PLANT

Western Rotary ventilators, with or without fans, can do the most for you. A 2 mph wind operates the Western Rotary—and it continues to exhaust during wind lulls due to superior balance design. Years of trouble-free performance—bearings carry lifetime guarantee. Check Sweet's or AEC for high exhaust capacity figures. Then specify Western—a first-rate line of rotary, stationary, continuous ridge, directional ventilators and exhaust fans. Handled by wholesalers coast to coast.

Western Engineering & Mfg. Co.

[illegible] OCEAN PARK AVE. [illegible]

Dealers—order from your local jobber.
Write for catalog, or tell us your special installation problems.

PROBLEM:
"We need a new heating system, but can't afford an expensive one."

SOLUTION:
"We saved $6000 by installing Delta OIL-FIRED UNIT HEATERS in our plant!"

"We had neither the space nor the funds to install a complex boiler system . . . and the cost of gas in this area was too high for our budget. So we struggled along with inadequate heating . . . until Delta direct-fired Oil Unit Heaters solved our problem. They're doing a big job at an unbelievably low cost!"

Delta DIRECT-FIRED OIL UNIT HEATERS

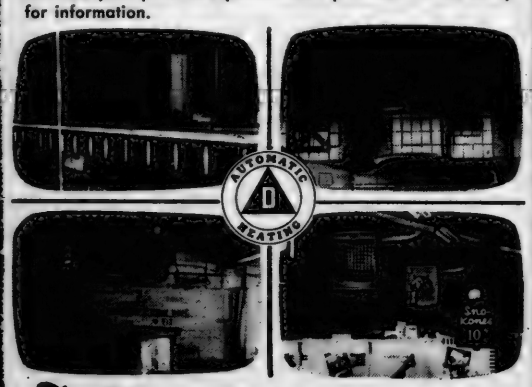
fit everybody's budget, everybody's needs.

SIMPLEST TO INSTALL: Big savings on installation costs. They need no large chimney, boilers, pipes, fittings. Factory wired and assembled . . . just hang them up.

LOWEST COST OPERATION: Delta's powerful pressure oil burner does a most effective and efficient heating job on low cost #2 fuel oil. Maintenance is simple and seldom. Costs 50% less to operate than old-style systems.

GREATEST COMFORT: Within seconds the Delta Unit Heater bathes the entire working zone with comfortable, even heat . . . with no cold spots, no overheating. Ten sizes from 112,000 to 220,000 BTU/hr. to meet all situations.

On your next installation, let DELTA OIL UNIT HEATERS solve all your price and performance problems. Write today for information.



Delta HEATING CORPORATION
10 COLE STREET • TRENTON 8, N. J.

ACCESS SPACE ALLOWANCE

(*Concluded from page* 110)

on, a sufficient air cushion will again be available in the chambers. This type of air chamber is not very efficient and the introduction of air must be performed as such time when the fixtures are not in use. It is time consuming.

Since the access space is available, it is of much greater benefit to install pipe air chambers at the end of the branches, properly supported and equipped with a pet cock, control valve and a drain valve. This type of a chamber, Fig. 3, because of its greater air volume will cushion the water more effectively. When it is necessary to replenish the air, the control valve is closed and the pet cock and drain valves are opened, without disrupting the fixture usage. The water in the chamber will drain out and is replaced with air. After this change has taken place, the chamber is once again ready for operation. Mechanical air chambers are also advantageous, but they should be properly supported to prevent strain on the piping.

For two batteries of fixtures, served by hot and cold water lines, one air chamber can protect the two cold water lines and similarly, one air chamber can safeguard the two hot water lines.

Aside from the advantages of an access space that were mentioned, there is the point that such space simplifies toilet ventilation. Instead of taking away part of the toilet space for ducts, for air outlets, the supply duct is run in the upper portion of the access space. It thus uses space that would normally be wasted, and it is also out of the way of the men who may have to work back of the pipes.

With regard to the amount of floor area utilized by the access space, the space required for a single battery of fixtures is just about twice that required for a regular pipe space for the fixture roughing without access. For a double battery of fixtures, the space is again just about twice that of a regular pipe space, the conditions in both cases being equal. Therefore, if on a proposed project, an access space is being considered for the fixtures by both architect and engineer, the advantages derived from the space far exceed the loss of some additional floor area.

In addition, if it is possible to locate the toilet rooms that the fiextures will be back to back as shown in Fig. 2, there will be greater savings in space than if two separate toilet rooms in different locations on the same floor are planned. To clarify this point, two separate access spaces for single batteries of fixtures would use up about four feet, whereas one access space for a double battery of fixtures requires about 30 inches as indicated in Fig. 2.

Although many favorable points have been made for access spaces, they were motivated by the thought that certain considerations should be noted if access spaces are contemplated. It is not the intention of this article to show a decided preference for access over regular pipe spaces.

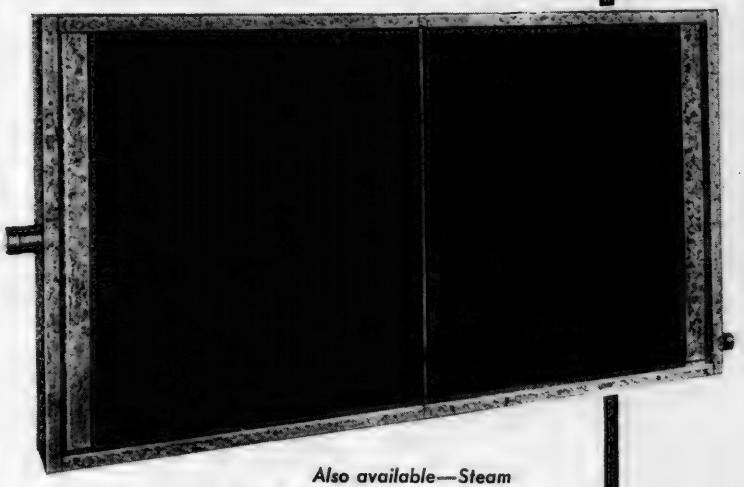
The points presented should be kept in mind during the design stages of the project. In this manner it will be possible to have not only an access space of minimum dimensions, but also one of adequate size. The chief advantage is that the finished walls in the toilet rooms are free of everything except the fixtures themselves. In addition, care in the selection and installation of valves, air chambers and equipment will provide for a system that is trouble-free in operation.

RIGIDBILT STANDARD STEAM HEATING COILS

Maximum Heat Transfer Assured!

Complete heat transfer by heavy aluminum fins, heavy galvanized steel casings. Extruded fin collars entirely surround copper tubes. Fully enclosed headers, thus air directed over finned section only. Bolted and punched casings for easy installation. Standard steam coils variable in height and length permit coil selection to your exact needs. Entire coil custom engineered and tested to 300 lbs. air pressure under water.

RIGIDBILT IS BETTER BUILT—Write for Catalog



Also available—Steam Distributing Tube Heating Coils.

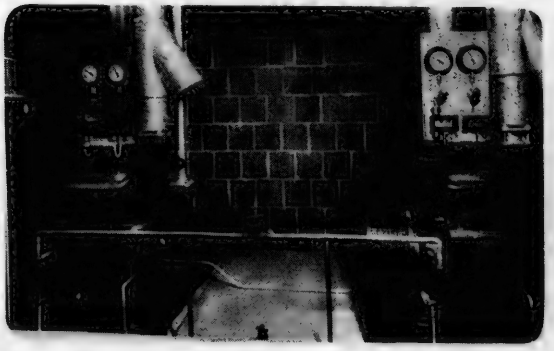
RIGIDBILT INC.

FULTON AND FRANCISCO • CHICAGO 12, ILL.

FAST DELIVERY!

AIR CONDITIONING & VENTILATING UNITS • UNIT & PRODUCT COOLERS • HEATING & COOLING COILS
ALSO COILS DESIGNED AND BUILT FOR SPECIAL APPLICATIONS

Frick "ECLIPSE" Compressors, like these installed in the Constitution Bldg., have 2, 3, 4, 6 or 9 cylinders.



Constitution Building, Atlanta, Installs Air Conditioning Throughout

This modern building, occupied by the Georgia Power Co., now enjoys year 'round air conditioning.

The main cooling load is carried on a "central station" basis by four Frick "ECLIPSE" compressors: two of these are installed in a penthouse, and the others on the fourth floor.

In addition, Frick unit air conditioners of 5 and 7½ hp. serve the retail store on the street level, and the executive suite on the fourth floor. Operation of both types of systems is very satisfactory.

Whether you are an owner, architect, builder, heating contractor, or refrigeration distributor, we have air conditioning equipment and services of interest to you. Write for literature, estimates, or dealer contracts today; certain good territories still open.

This 5-hp. Frick unit air conditioner is equipped with duct work to condition the retail store of the Georgia Power Co.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

DOWN-DRAFT VIEW
Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.
UP-DRAFT VIEW
Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.
field
"MG" Draft Controls
ENGINEERED SPECIFICALLY FOR
GAS
fired industrial and commercial plants
1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provides simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
6. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases — resulting in greatly increased life.
The Field "MG" has met the most rigid municipal requirements for commercial and industrial installations. It is being used with full approval of the nation's leading gas companies in the nation's largest cities. Fully safe, fully proven, it provides for gas-fired installations the same accurate, dependable performance, the fuel economy so long provided by Field Draft Controls for oil and coal fired furnaces. Write for complete information.
FIELD CONTROL DIVISION
of H. D. Conkey & Company — Mendota, Illinois
AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

What Would You Do?

(*Concluded from page* 134)

air breathed by humans is transferred in the nasal cavity. Only a slight amount of water vapor is absorbed in the lungs. Incidentally, practically all of the heating (or cooling) of the air also takes place in the nasal cavity, so that the nose serves as a very good year-around air conditioning unit. At a given room air temperature, varying the relative humidity in the room from 13 to 97 per cent made very little difference in the moisture condition of the air leaving the nasal cavity on its way to the lungs. The nose attempts to add the moisture as needed.

A sudden change in intake air conditions, such as encountered when entering a dry, warm room from the cold outdoors can cause trouble by quickly overtaxing the moisture evaporation process in the nose. This, in turn, may cause a loss of germicidal protection against infectious organisms present, resulting in a respiratory infection. To reduce this hazard, the tests indicated that for moderately cold weather, the relative humidity indoors generally should be between 40 and 60 per cent.

Gayle B. Priester
Air Conditioning Engineer,
Consolidated Gas Electric Light and Power Company of Baltimore
Baltimore, Md.

The best conditions to maintain in an assembly room where women are seated working with small electrical parts for an electronic unit would be somewhere within the air conditioning comfort zone—that is, 75F and 50% relative humidity.

There is no humidity range which will of itself kill bacteria. Where a triethylene glycol spray is used, the humidity should not be permitted to go below 40%, although we are inclined to question the effectiveness of this solution in reducing the bacteria count in an air conditioned space.

Sam Soling
Chief, Industrial Application Engineer
York Corp.
York, Pa.

• • •

• The appointment of E. D. Burke as director of advertising and public relations for the Garrett Corp., has been announced. At the same time, it was announced that Ken Frogley had joined the company as public relations manager. For the past four years, Mr. Burke has served as public relations manager for the Garrett Corp. He has been associated with the company since 1941. Mr. Frogley was formerly public relations director for American Airlines, Western region, and more recently, in charge of public relations for the Las Vegas Chamber of Commerce.

• The election of Lieutenant General Albert C. Wedemeyer (USA, Ret.) as a vice-president and director of Rheem Manufacturing Co. was announced recently. Gen. Wedemeyer will make his headquarters at the company's New York executive offices. General Wedemeyer has resigned a similar post which he held since 1951 with Avco Manufacturing Corp. He joined Avco shortly after his retirement in 1951 upon completion of 32 years of military service during which time he won recognition as one of the nation's outstanding military strategists.

HEATING AND VENTILATING'S *Ad-Digest* SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

COOLING TOWERS. Page 133. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in this company's cooling towers is protected against these twin enemies. Creosote, with 162 elements toxic to fungus growth and parasites, also makes wood more resistant to chemical attack. Information available. ----------Item 201

EVAPORATIVE CONDENSER. Page 125. Evaporative condensers that eliminate waste-water disposal problems and pumping costs. Engineered to give maximum efficiency and performance at reasonable cost. Available in sizes from 3 to 100 tons. Information available. ----------Item 202

FIRE PROTECTION EQUIPMENT. Page 165. This company's line of interior fire protection equipment includes 480 cabinets alone. This equipment is proved reliable, economical, easy to install and generally best for clients. Information available. ----------Item 203

PIPE. Page 62. Made of finest steel, this company's pipe is closely quality-controlled by one producer from ore mine right through to the final threading operation. This pipe will insure adequate protection to your water supply for years to come. Information available. ----Item 204

STEAM TRAPS. Page 31. This company offers two steam traps, the standard, and the high pressure integral strainer. The standard impulse steam trap serves all normal trapping requirements. The integral strainer high pressure impulse steam trap operates on some of the highest pressure steam line in the country. Bulletin available. ----------Item 205

ELECTRIC MOTORS. Page 139. This company's capacitor-start induction motors are the right kind of motors to use for most single-phase applications. They have become first choice of many leading manufacturers of air conditioners, refrigerators, freezers, water pumps, and motor-driven tools, and are used in many other similar fractional or integral horsepower applications. Information available. ----Item 206

BOILER. Page 22. This company's boiler, with jet-action curculation gives more heat for a given amount of fuel than any other boiler of the same capacity. Information available. ----------Item 207

SMALL MOTORS AND BLOWERS. Page 153. This company offers manufacturers the latest developments in electric motor design in a wide selection in sizes from 1/500 to 1/6 hp. and blowers from 50 to 280 cfm. Information available ---Item 208

WATER LEVEL CONTROL. Page 169. In boiler water level control, there's no such thing as being half safe. This company's principle eliminates the causes of eventual failure inherent in other controls. This company's control has infinite operating life. Information available. ------Item 209

ELECTRIC MOTORS. Page 27. Many of America's best known oil burner manufacturers depend upon this company's electric motors to keep their units operating efficiently. This company builds motors for specialized applications such as oil burners, and for all types of equipment where dependability and long life are important. Bulletins available. ---Item 210

PACKAGED BOILER. Page 161. This packaged oil heating unit has everything you need to make a profitable sale. It is made of cast iron. This boiler is an investment in life time comfort. It provides plenty of steaming hot water, all year round, for laundry, kitchen and bath, and at low cost. Brochure available. -Item 211

COPPER TUBING. Page 55. This company's copper pipelines are economy pipelines. They adapt easily to any plant layout and equipment. These tubes speed assembly and may be bent so you can clear beams, girders, and other obstructions, without extra joints and fittings. Booklet available. ----------Item 212

HEAT EXCHANGERS. Page 33. The first line of extended surface heat exchangers made by this company which makes nothing but heat surface exclusively. The company has unequalled experience, production facilities, and materials testing and design research. ----------Item 213

POWER TRANSMISSION. Pages 10. 11. This company's control-motor-drive combination on air conditioning jobs benefits the designer in three ways—engineering help, coordinated equipment and guaranteed performance. Engineering literature available. ----------Item 214

AIR CONDITIONING PUMPS. Page 121. You'll find it pays off in hard cash to rely on this company for your air conditioning pump needs. That is because this company's representative or distributor is an experienced, highly qualified specialist who will give you full cooperation at every step of the way. Bulletins available. ----------Item 215

FILTERS. Page 32. Random thoughts from a filter engneer. This ad states that engineers do have imagination. It tells how to evaluate filter tests, or proof positive of filter value, and explains why the highest efficiency filter isn't always the best. This company has 29 years experience in giving people what they want in a filter. If it's high efficiency you want, they offer a filter which traps particles as small as 1/250,000 of an inch. Information available. ----------Item 216

BOILERS. Page 37. Satisfaction with the performance of this company's boiler is proved by the number of units in service and on order for industries, utilities, and other users in practically every category. In terms of total steam capacity, they add up to about 9 million pounds per hour, and better than half this capacity is in multiple unit installations. Bulletin available. ----------Item 217

AIR RECOVERY. Page 71. This company's air recovery system is a simple method for reconditioning used air, making it completely odor-free and fresh for re-use. This sharply reduces the amount of outside air that has to be taken into the system and reduces the size and cost of heating and cooling equipment; and offers continuing savings in operating cost. Information available. ----------Item 218

POWDER POWER TOOL. Page 137. A fast acting system of drive pins and explosive cartridge action for fastening duct work to steel or concrete features an exclusive break-open action of the holding tool and a single standard powder charge regardless of penetration desired. Cannot be discharged accidentally. Air conditioning ducts installed in a Miami hotel in record time with this tool. Literature available. ----------Item 219

VALVES. Page 141. Conventional valves were previously used on the Truclean dry-cleaning machine. Not until this company's diaphragm valves were tried was their designed-in superiority for this service fully realized. Working parts of the formerly used valves were continually exposed to the effects of the gritty sediment solution. Not so with this company's diaphragm valves. Standard equipment on these machines now for more than three years this company's valves show a record of no trouble, no leaks, and no repairs, at a no-premium price. Information available. ----------Item 220

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below item numbers on which you wish further information.

201	202	203	204	205	206	207	208	209	210	211	212	213	214
215	216	217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240	241	242
243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284
285	286	287	288	289	290	291	292	293	294	295	296		

PLEASE PRINT Sept. AD-54

This service available only to U. S. and Canadian readers

Name..... **Title**.....

Firm .....

Nature of Firm's Business.....

Street .....

City..... **Zone**..... **State**.....

This card is void after Dec. 1, 1954

Ad-Digest SERVICE

FANS. Page 15. One way to reduce your noise level is to select quiet fans. And now, as never before, you can enjoy almost unbelievable quiet with this company's new fan. Streamlined air movement through this company's six inlet vanes and new backward curved blade wheel, results in high efficiency, superb smoothness and quietness. Bulletin available. .....Item 221

AIR DISTRIBUTION. Page 151. It's a big order to get draft-free, engineered air distribution, from inconspicuous diffusers which harmonize with acoustical ceiling designs, without signs of smudging or streaking adjoining acoustical blocks. Yet that's the experience record with this company's rectangular ceiling diffusers. This company is first with diffusers to match acoustical ceilings. Information available. .....Item 222

HOT WATER SYSTEM. Page 127. In recent extensive modernization activities at the Narragansett Hotel, the hot water supply was not overlooked. The hotel replaced a bulky storage tank with this company's compact, modern instantaneous heater. Now, this single tankless source supplies water at 180 degrees for the kitchen, and through the use of this company's thermostatic mixing valve, water at 140 degrees for guest use. Information available. .....Item 223

UNIT HEATERS. Inside front cover. You get heat where you want it, when you want it, whatever the fuel you use with this company's unit heaters. This company's name is backed by over 40 years of heating experience. Regardless of the type of model you choose, you can depend on this company's unit heater to give balanced heating performance plus maximum fuel economy. Information available. .....Item 224

THERMOSTATIC CONTROLS. Page 50. This company's longer lasting quality insures your reputation. This company's performance tested design combines pioneering experience with engineering leadership. The use of specially chosen metals assures your customers of years of positive, accurate temperature control with lowest maintenance cost. Information available. .....Item 225

HEATING AND VENTILATING UNITS. Page 155. This company's heating and ventilating units are almost as versatile as a one-man band. They can be horizontally suspended, vertically suspended, or floor mounted, in schools, auditoriums, gymnasiums, garages, mills, factories, and other large area buildings. Information available.....Item 226

VENTILATION. Page 157. Where the problem is ventilation, the solution is this company's system. This company's rotary ventilators with or without fans can do the most for you. A 2 mph wind operates this company's rotary, and it continues to exhaust during wind lulls due to superior balance design. Information available. .....Item 227

WING CAP VALVES. Inside Back Cover. Back of the unprecedented demand for this company's wing cap valves is a leadership in design. Year after year these valves become more popular on both government and civilian refrigeration and air conditioning installations because of the high inherent quality of the valve and their features of design and construction. Information available.....Item 228

PRECIPITATOR. Page 73. This company's precipitator combines the latest design development for electronic air cleaning. Send for their bulletin today. The new bulletin has information of interest to every engineering department. Keep it handy to answer filtration questions on industrial ventilation. Bulletin available. .....Item 229

SOLENOID VALVES. Page 25. This company carries a complete line of solenoid valves for Freon, liquid line, suction line, or hot gas discharge service, for brine, water, steam, air or oil, for all types of electric current and for wide range of connections. Special valves for special applications are available. Bulletin available.....Item 230

MOTORS. Page 43. The red power spot on refrigeration or air conditioning equipment means powered by this company's motors, the most dependable motors ever available to industry. 1 to 250 hp, AC and DC N.E.M.A. standard frames. All types of enclosures. Publication available. .....Item 231

AIR FILTERS. Page 167. No filter does all jobs, meets every need. That's why this company's filters are engineered to the job to offer more effective dust collection. This company's expanded metal face plate acts as a lint arrestor to provide easier cleaning and surfacing. It distributes air easily over the entire filter area. Bulletin available.....Item 232

COPPER TUBING. Page 117. 28,000 lbs. of this company's copper water tube are used for air and oxygen systems, hot and cold water lines in the Sparks Memorial Hospital, Fort Smith, Arkansas. This is an interesting example of the versatility of this company's copper water tube. Use this company's tube for air conditioning lines, radiant panel heating, hot and cold water lines, underground service lines, waste stack and vent lines, and processing lines. Information available....Item 233

DRAFT CONTROLS. Page 160. This company's draft control has met the most rigid municipal requirements for commercial and industrial installations. It is being used with full approval of the nation's leading gas companies in the nation's largest cities. Information available. .....Item 234

VENTILATORS. Page 168. Performance plus appearance make this company's ventilators a popular partner on many important projects. These self-contained proper fan roof ventilators come on the job as a complete package, ready for installation. They feature clean contours, substantial weather-proof housings, direct or V-belt drives, and capacities from 400 to 40,000 cfm. Literature available. .....Item 235

BLOWER UNITS. Page 36. This company's blower units feature drain pans, double metal pan under coil section completely seals insulation; multiple access panels, all fitted with corrosion-proof solid die-cast aluminum alloy latch handles, and the company's special frames, which give strength to spare. Catalogs available. .....Item 236

VALVES. Page 21. This company's valve was designed for the critical requirements of controlling oxygen, nitrous oxide, or any non-flammable gases in hospital services. Industry was quick to note its unique advantages and it is now frequently specified for systems carrying gaseous fluids for heating, cooling, lighting and processing. Bulletin available.....Item 237

EXPANSION JOINT. Page 39. One of the many reasons why this company's packless expansion joints are so widely used by progressive engineers is the completeness of its line. There is a joint to absorb pipe expansion under any piping conditions. Information available.....Item 238

AIR DIFFUSERS. Page 51. Floor to floor height can be kept to a minimum and usable floor space to a maximum with this company's high velocity air conditioning. These units, used with smaller than conventional ducts, save space, and money too. Manual available.....Item 239

DUCT FANS. Page 171. These are easily installed units for high efficiency air movement in all duct systems. Direct driven types for atmosphere within safe motor operating limits or belted models for hazardous fumes, vapors and excessive temperatures are available. Capacities to 120,000 cfm. Folder available.....Item 240

EVAPORATIVE CONDENSER. Page 68. The Los Angeles Saint Sophia Greek Cathedral installed this company's heavy duty evaporative condenser. Completely air conditioned, the church chose this company's evaporative condenser as a unit that would stand up under long usage. Information available.....Item 241

COOLING SYSTEM. Page 143. Whether the particular requirements of a building make one system or a specially engineered combination of air conditioning systems the most practical choice, this company has the answer. A complete line of equipment for every air conditioning need is produced in this company's windowless air conditioned plant. Information available.....Item 242

AIR DIFFUSERS. Page 154. A complete line of air diffusers in both fixed and adjustable outlets with neck sizes from 5 to 32 inches and capacities from 50 to 13,400 cfm. Round, half-round and square styles are offered in attractive finishes. Selection charts and engineering data available. .....Item 243

WELDED HERMETICS. Page 63. This company's welded hermetics bring cool-running, 2-cylinder smoothness to package air conditioning. This company's package is engineered at its best. Twin cylinders bring whisper-quiet smoothness. Heavy-duty, high power factor motor insures positive performance and long range economy. Information available.....Item 244

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U.S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

AIR CONDITIONING SYSTEM. Page 41. This company's installations are planned, made and installed by the company to meet the exact needs of the individual control problem encountered, thus insuring the desired results at the lowest possible operating cost. Information available.....Item 245

FORGED FLANGES. Page 49. No organization has been so closely identified with the development of forged steel flanges as this company. No organization or individual has had so much to do with the study of design, strength, bolting practices, and the establishing of flange standards. This company started first and has remained first in scope of flange types, sizes, weights, and materials, and in volume produced. Booklet available.....Item 246

TEMPERATURE MEASUREMENT. Page 152. This company's temperature measuring instrument is invaluable for balancing hot water heating systems, reading floor, wall or ceiling temperatures, checking refrigerated coils, insulation and all other low temperature surfaces. Bulletin available.....Item 247

MODULATED HEAT. Page 67. With this company's system, every room in a building is an individual zone, with its own thermostat. Every room is heated with filtered warm air, continuously circulated by a compact, recessed wall unit. Literature available.....Item 248

UNIT HEATERS. Page 40. For over 25 years, this company has paced the field in unit heating. Every model provides perfect heating comfort plus lowest possible fuel cost. This balanced heating is the result of discharged temperatures of 110 to 120 degrees F being correctly related to heat throw and air volume. Bulletin available.....Item 249

PERIMETER HEATING. Page 2. This heating system is always in proper balance. It delivers heat in the desired amount for each room or section of the building. Shut off one room or an entire floor and the system automatically compensates for the decreased demand. Information available.....Item 250

EXHAUSTER MOTORS. Page 164. Once this company's exhauster is set in a wall or on a roof, you can forget maintenance because the motor is lubricated for ten years of normal service. Since the bearing is the heart of any motor, you know this vital part is adequately protected in this company's exhauster. Catalog available.....Item 251

CONVECTOR RADIATION. Page 167. For those who want modern heating at its finest, there is only one answer, this company's convector radiation. Unmatched performance is combined with quiet beauty, long life with uniform, healthful heating. Bulletin available.....Item 252

MOISTURE CONTROL. Page 153. This company's air conditioning provides you with any temperature and relative humidity you need, held constant or varied at will. Using this company's absorbent, you save the refrigeration commonly used to condense moisture and make reheat unnecessary in most cases. Bulletins available.....Item 253

UNIT HEATERS. Page 171. This company's ceiling mounted electric blower type heaters are your quick, easy answer to space heating. Catalog available.....Item 254

GRILLES. Page 157. This company's grille, with detachable volume control, features increased directional control, elimination of possibility of tampering or accidental changes and accurate metering of air flow. Matching return air grilles available. Information available.....Item 255

AIR DIFFUSERS. Pages 16, 17. This company's air diffusers are styled to harmonize with contemporary architectural concepts. In performance, the flexibility of the line permits engineers to select a type and size that will operate with top efficiency. Simplicity of design and rugged construction results in simplified installation. Catalog available.....Item 256

SHUTTERS. Page 171. A ventilating shutter with exceptionally snug fit to keep out rain, snow and insect pests, and is sensitive to air currents, offering less resistance to fan pressure. Available from 12 to 72 inches square and also rectangular shapes. Catalog available.....Item 257

AIR FILTER. Page 23. This company's filter, an unoiled media of selected synthetic fibers, removes and retains dust particles from the air stream by means of an accumulated static charge. Exceptional capacity means infrequent servicing. Rinse under open water faucet or nozzleless hose, shake out, and return. Rustproof aluminum frame. Bulletin available.....Item 258

STORAGE HEATERS. Pages 58, 59. High above Pittsburgh's famous golden triangle, towers a glistening new skyscraper. This magnificent 41-story structure houses the main offices of the United States Steel Corporation and the Mellon banking interests. From tower to basement, 10 of this company's copper-lined storage heaters provide an abundant supply of rust-free hot water. Information available.....Item 259

WEATHER CONDITIONING. Page 29. Whether your needs are heating or air conditioning equipment, get the facts on this company's complete line before you buy. This company offers so much more in quality, economy, and efficient performance. Information available. Item 260

FANS. Page 163. When planning your ventilating systems, get all the facts. Each new job presents different cooling and ventilating problems that this company can successfully solve for you. Write for complete data on the hundreds of possibilities offered in the wide range of styles, sizes, and capacities. Data sheets available.....Item 261

WROUGHT IRON PIPING. Page 7. It isn't unusual at all for designers to divide the advantages of wrought iron pipe for snow melting into installation advantages and service advantages. This company calls them the before-and-after advantages of wrought iron, but regardless of title, they are mightily essential to that all important goal, economy. Bulletin available.....Item 262

AUTOMATIC BOILER. Page 48. This company's automatic boiler includes such features as fiber glass insulation with metal jacket and metallic paint finish, lift lugs for convenient handling on job site, boiler shell made of flange quality steel with all joints electrically welded, high pressure shells x-rayed to insure flawless construction and long life. Among its many other features, this boiler has the spinning gas technique. Catalogs available.....Item 263

Use this Digest to locate and refer to advertisements appearing in this issue of HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

AIR FILTER. Page 149. This filter consists of a thick blanket of bonded glass fibers possessing cleaning efficiency, dust holding capacity and high velocity rating of a viscous filtering media, can be made in lengths up to 70 feet and is sufficiently resilient and flexible to permit packaging in compact 13 inch diameter rolls. Bulletin available.....Item 264

UNIT HEATERS. Page 48. This company offers you a complete line of commercial and industrial unitary-type heaters for maximum flexibility in layout and design. The line includes cabinet unit heaters, gas fired unit heaters, vertical unit heaters, and horizontal unit heaters. Information available.....Item 265

VACUUM HEATING PUMP. Pages 60, 61. This company's vacuum heating pumps perform as rated year after year, in properly installed and serviced systems, without expensive repairs, and at low amperage. That's because this company's pumps have no fine tolerance parts, they need no close clearance adjustments to maintain full capacity. One simple impeller is the only principal moving element. Information available.....Item 266

STEAM TRAPS. Page 119. This company's steam traps have heavy duty bellows integral with the valve as their only moving part, a substantial factor in their low maintenance cost. They also have a larger valve orifice. This noteworthy feature results in the valve's two to six times average drainage capacity. Catalog available.....Item 267

DUCT. Page 169. This new spiral-wire reinforced ducting has many features which can mean savings in time and money. Information available.....Item 268

VENTILATING FANS. Page 20. Here's the latest in this company's famous line of power roof ventilators, the new model B with centrifugal fan wheel. Ruggedly constructed for years and years of trouble-free service, this new fan has several outstanding features, including quiet operation, protected motors and maximum capacity. Information available.....Item 269

HEAVY OIL BURNERS. Page 155. These oil burners use commercial No. 4 or No. 5 heavy oils and are especially designed for heating buildings requiring more than 6,000 gallons of oil or 45 tons of coal per year. Conversion is simple. Bulletin available.....Item 270

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below item numbers on which you wish further information.

201	202	203	204	205	206	207	208	209	210	211	212	213	214
215	216	217	218	219	220	221	222	223	224	225	226	227	228
229	230	231	232	233	234	235	236	237	238	239	240	241	242
243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284
285	286	287	288	289	290	291	292	293	294	295	296		

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Firm .....

Nature of Firm's Business.....

Street .....

City..... **Zone**..... **State**.....

This card is void after Dec. 1, 1954

Ad-Digest SERVICE

STEAM COILS. Page 159. These standard steam heating coils assure maximum heat transfer. They have heavy aluminum fins and heavy galvanized steel casings. Extruded fin collars entirely surround copper tube. Steam distributing tube heating coils are also available. Catalog available. ----Item 271

PIPING SYSTEM. Page 65. This company's prefabricated insulated piping systems feature advance design with positive security, outstanding economy, and quality for underground and overhead distribution of steam, condensate return, hot and chilled water. Additional information available. ----Item 272

FREON COMPRESSOR. Page 30. Years were spent in developing this new Freon compressor whose features include trim, sturdy construction, easy removal of gas strainer in the suction line, operating efficiency, and high capacity. Information available. ----Item 273

STEAM COILS. Page 169. A line of steam coils with defroster for use in combination with air conditioning coils or as tempering or booster units in long heating ducts. Information available. ----Item 274

HEATERS. Page 162. This company's installation requires only the connection of fuel supply, connection to power line, connection to exhaust stack, and it is ready for automatic operation. A self-contained stainless steel combustion chamber eliminates the costly, time-consuming task of refractory lining. Bulletin available. ----Item 275

YEAR ROUND AIR CONDITIONING. Page 159. The Constitution Building in Atlanta has installed this company's air conditioning throughout. The main cooling load is carried on a central station basis by four compressors: two of these are installed in a penthouse, and the others are on the fourth floor. In addition, this company's unit air conditioners of 5 and 7½ hp serve the retail store on the street level and the executive suite on the fourth floor. Information available. ----Item 276

PUMPS. Page 45. Get the most from your pump investment. There is a wide range of types and capacities for every heating pump need. Let this company advise you on your next tough job. Bulletins available. ----Item 277

ELECTRIC MOTORS. Page 125. Among the many features embodied in the design for this company's motors is the resilient mounting specifically engineered to hold the motor securely in place during shipment and in all mounting positions. If you have an unusual motor problem, let us hear from you. Information available. ----Item 278

COOLING TOWERS. Page 131. Today a cooling tower is a must in every air conditioning installation involving water-cooled-condensing units. Homes are no exception. In many communities the use of water for this purpose is restricted. In others high water rates result in excessive operating costs. This company's residence cooling tower makes it possible to cool and recirculate the condensing water at a tremendous saving. Bulletins available. ----Item 279

EXPANSION COMPENSATOR. Page 147. For the first time, there is a practical, economical answer to the problem of expansion control in low pressure steam and hot water heating systems. The answer is this company's new expansion compensator. It is specially designed and manufactured for finned type convectors, baseboard radiator or heating supply lines. Bulletin available. ----Item 280

FORGED WELDING. Page 123. You are sure to get the latest cost saving developments in fittings and flanges when you specify this company's forged welding fittings. Year after year since introducing forged welding fittings in the United States this company has consistently set the pace in research, quality control, development of new types, sizes and materials and in piping engineering. Information available. ----Item 281

TRAPS. Page 14. This company's float and thermostatic traps operate under vacuum with the same high efficiency as under pressure. No more water-logging in mains, no more air pockets, an end to morning overload troubles. The condensate control valve provides complete and instantaneous drainage of condensate. Bulletin available. ----Item 282

WATER LEVEL CONTROLS. Back Cover. There is a safety device for every type and size of heating boiler and hot water plant found in schools, operating at any pressure up to 150 pounds, manufactured by this company. Included among the controls are controls for steam heating boilers, fuel cut-off requirements, high pressure steam boilers, and hot water heating boilers. Catalog available. ----Item 283

BIFURCATOR FANS. Page 1. This induced draft bifurcator is a motor driven axial flow fan in a divided housing. The motor is in an isolated chamber around which flue gases are bypassed so that motor always remains clean, accessible, and at safe temperature. Bulletin available. ----Item 284

PROJECTION HEATERS. Pages 46, 47. Warm air trapped in heat hungry high ceilings can be driven back down to the floor again by this company's projection heaters. With this company's exclusive equalizing system in operation, ceiling thermostats permit the heater fans to salvage warm ceiling air, and push it down to floor level. Bulletin available. ----Item 285

AIR ELIMINATOR. Page 54. This company's new air eliminator provides a simple, inexpensive, but highly efficient means of collecting and automatically removing air from radiant coils, baseboards or convectors. Air in water moves with circulation and is trapped and released by the eliminator, thus preventing air from interfering with circulation. This operation is accomplished by breaking the flow of water which causes air to separate from the water. Information available. ----Item 286

TEMPERATURE CONTROL. Pages 18, 19. In the modern buildings of many famous colleges from coast to coast, such as MIT, Harvard, Carnegie Tech, U.C.L.A. and CIT, you will find this company's pneumatic systems of temperature control. Since 1891 they have been outstanding for their many years of dependable service with a minimum of maintenance. Information available. ----Item 287

FABRICATION SERVICE. Page 172. By eliminating numerous flanged joints and combining several fittings into one integral unit, this company's fabrications assure greater efficiency and real economy from the simplest to the most complex layout. Bulletin available. ----Item 288

AIR CONDITIONING UNITS. Page 72. A line of air conditioning units for remote applications for multi-room installation and for larger buildings where hot water is piped to the units in the winter and chilled water in the summer. Units are available in 200, 400 and 600 cfm capacities. Bulletin available. ----Item 289

ELECTRIC MOTORS. Page 53. A new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact Tri-Clad 55 motor, in ratings from 1 to 30 hp AC. To reduce noise, this company's engineers developed a new concept, a sonant motor, a motor that sounds pleasing to the ear. In addition, the modern looking motor is lighter and smaller, it saves weight and space. Bulletins available. ----Item 290

SNOW MELTING. Page 42. For sidewalks, driveways, and parking area snow melting and ice removal systems, steel pipe is the overwhelming choice. For steel pipe is economical, formable and weldable for grid and coil fabrication and has been proved in more than 60 years of conventional hot water and steam heating applications. Booklet available. ----Item 291

UNIT HEATERS. Page 64. For today's outstanding heating value, look to a pioneer name in unit heaters, look to this company's unit heaters. Check before you specify, all the features such as instant heat, quiet heat, low cost heat that add up to traditional unit heater superiority. Information available. ----Item 292

PACKAGED AIR CONDITIONING. Page 165. This company's air conditioning offers you the biggest profit opportunity ever in this mushrooming industry. With a size for almost every requirement and engineering that is far ahead of the entire field, you will be giving your customers real effeciency, real economy and lasting satisfaction. Information available. ----Item 293

TANK SERVICES. Page 165. Cut your tank costs with this company's two complete services, tank fabrication, and tank lining. This company is known for quality fabrications for 50 years. Information available. ----Item 294

UNIT HEATERS. Page 38. This automatic, gas-fired unit heater provides quiet, thermostat-controlled heat when and where it is needed. There is no waste fuel in warm-up and standby time, no costly boiler room and piping system, and no fuel handling. Information available. ----Item 295

ELECTRONIC CONTROLS. Page 24. This company has available not only a complete range of reliable instruments for control of temperature, humidity, or industrial processes, but you can benefit from this company's vast reservoir of application experience. Information available. ----Item 296

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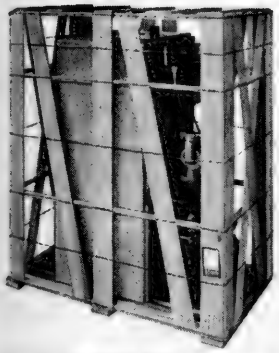

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Installation savings alone make this boiler a bargain! Burnham quality makes it <u>doubly</u> attractive.

Here's a new packaged oil heating unit that has everything you need to make profitable sales. It's cast iron. It's a fuel saver. It's an investment in lifetime comfort. It provides plenty of steaming hot water, the year 'round, for laundry, kitchen and bath . . . and at low cost! Its net IBR water rating is 530 sq. ft. Attractively styled jacket is handsome two-tone blue and silver gray Hammerloid baked enamel finish, heavily insulated to prevent heat loss. It comes factory assembled "ready to go" . . . at a big saving in installation time and money! This is what you've been waiting for. It's *your* answer to quality home heating at low cost! Mail the coupon today. Get all the facts about this money maker!

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An Olson installation requires only the connection of fuel supply, connection to power line, connection to exhaust stack and it's ready for automatic operation—unattended. A self-contained stainless steel combustion chamber eliminates the cotsly, time-consuming tark of refractory lining. Greatest of all, the initial cost is so much lower than other types of heating.

These attractive installation features are made possible because Olson Heaters are completely factory-assembled by the same expert craftsmen who build them. It comes to you as a complete self-contained unit, preflame-tested, pre-regulated, ready to start a long life of smooth heating service for its owner.

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REPRESENTATIVES IN PRINCIPAL CITIES

HEATERS FOR GAS, OIL COAL OR DUAL GAS AND OIL.

SEASONAL DEGREE-DAY TOTALS

(A) Airport readings; (C) city office reading;
(O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 26th Year of Publication of Monthly Degree-Day Data

City	Season		
	1953-54	1952-53	Normal
Abilene, Texas (A)	2344	2286	2707
Albany, New York (A)	6348	6263	6938
Albuquerque, New Mexico (A)	3787	4282	4389
Alpena, Michigan (C)	8277	7351	7938
Anaconda, Montana (C)	7400	7464	8261*
Asheville, North Carolina (C)	3929	3900	4072
Atlanta, Georgia (A)	3595	2754	2826
Atlantic City, New Jersey (C)	4251	4143	4741
Augusta, Georgia (A)	2357	2386	2138
Baltimore, Maryland (C)	3636	3764	4203
Billings, Montana (A)	6561	6144	7078
Binghamton, New York (C)	6025	5700	6520
Birmingham, Alabama (A)	2641	2609	2788
Bismarck, North Dakota (A)	8153	8410	8967
Block Island, Rhode Island (A)	5157	5154	5816
Boise, Idaho (A)	5223	5509	5890
Boston, Massachusetts (A)	5185	5211	5784
Bozeman, Montana (C)	7345	7569	8425*
Buffalo, New York (A)	6099	6136	6792
Burlington, Iowa (A)	5525	5919	6101
Burlington, Vermont (A)	7172	6880	7799
Butte, Montana (C)	7600	7901	8162*
Cairo, Illinois (C)	3496	3592	3756
Charleston, South Carolina (C)	1591	1612	1769
Charlotte, North Carolina (A)	3016	2993	3205
Chattanooga, Tennessee (A)	3200	3246	3384
Cheyene, Wyoming (A)	6553	7108	7490
Chicago, Illinois (C)	5315	5596	6077
Cincinnati, Ohio (C)	4044	4108	4532
Cleveland, Ohio (A)	5349	5445	5996
Columbia, Missouri (A)	4458	4792	5107
Columbia, South Carolina (C)	2119	2175	2284
Columbus, Ohio (C)	4523	5026	5277
Concord, New Hampshire (A)	6763	6662	7544
Concordia, Kansas (C)	4770	5262	5323
Dallas, Texas (A)	2166	2191	2272
Dayton, Ohio (A)	4854	5273	5591
Deer Lodge, Montana (C)	7454	7764	8582*
Denver, Colorado (A)	5074	5770	6116
Des Moines, Iowa (A)	5881	6397	6429
Detroit, Michigan (A)	5807	5857	6396
Devils Lake, North Dakota (C)	9156	9208	9832
Dodge City, Kansas (A)	4565	4812	5058
Dubuque, Iowa (A)	6607	7076	7235
Duluth, Minnesota (C)	9116	9248	9417
Eastport, Maine (C)	(a)	7150	7969
Elkins, West Virginia (A)	5653	5464	5733
El Paso, Texas (A)	2434	2410	2641
Ely, Nevada (A)	6999	7508	7377
Erie, Pennsylvania (C)	(a)	5463	6099
Escanaba, Michigan (C)	7776	7849	8500
Evansville, Indiana (A)	4240	4295	4360
Fargo, North Dakota (A)	8639	8768	9208
Forth Smith, Arkansas (A)	3183	3361	3188
Fort Wayne, Indiana (A)	5586	5871	6270
Fort Worth, Texas (A)	2252	2111	2361
Fresno, California (A)	2523	2543	2532
Galveston, Texas (C)	1024	1011	1211
Grand Junction, Colorado (A)	4970	5534	5796
Grand Rapids, Michigan (A)	6291	6316	7027
Green Bay, Wisconsin (A)	7382	7796	8169
Greensboro, North Carolina (A)	3634	3583	3810
Greenville, South Carolina (A)	2855	2851	3060
Harrisburg, Pennsylvania (A)	4820	4795	5258
Hartford, Connecticut (A)	5460	5431	6125
Hatteras, North Carolina (C)	1958	2151	2392
Havre, Montana (C)	7729	7573	8155
Helena, Montana (A)	7358	7505	8202
Houston, Texas (C)	1121	1137	1276
Huron, South Dakota (A)	7413	7664	7876
Indianapolis, Indiana (A)	5036	5232	5611
Jackson, Mississippi (A)	2151	2086	2202
Kansas City, Missouri (A)	4270	4684	4888
Knoxville, Tennessee (A)	3446	3437	3590
La Crosse, Wisconsin (A)	6718	7327	7619
Lander, Wyoming (A)	6870	7526	8273
Lansing, Michigan (A)	6434	6482	6936
Lewiston, Maine (O)	7191	6341	7707*
Lincoln, Nebraska (C)	5360	5835	5858
Little Rock, Arkansas (A)	2800	2929	2982

City	Season		
	1953-54	1952-53	Normal
Livingston, Montana (C)	7018	6848	7185*
Los Angeles, California (C)	1111	1314	1451
Louisville, Kentucky (A)	4106	4125	4439
Lynchburg, Virginia (A)	3926	3891	4153
Macon, Georgia (A)	2032	2138	2049
Madison, Wisconsin (C)	6509	6882	7260
Marquette, Michigan (C)	7798	7918	8373
Memphis, Tennessee (A)	2915	3054	3137
Meridian, Mississippi (A)	2303	2266	2333
Milwaukee, Wisconsin (A)	6431	6721	7153
Minneapolis, Minnesota (A)	7232	7775	7828
Moline, Illinois (A)	5817	6250	6356
Montgomery, Alabama (A)	2061	2126	2137
Nantucket, Massachusetts (A)	4650	5431	6046
Nashville, Tennessee (A)	3446	3432	3513
New Haven, Connecticut (A)	5444	5303	6008
New Orleans, Louisiana (C)	1087	1001	1175
New York, New York (C)	4401	4462	5050
Newark, New Jersey (A)	4740	4637	5252
Norfolk, Virginia (A)	3108	2722	3454
North Head, Washington (C)	(a)	(a)	4767
North Platte, Nebraska (A)	6152	6566	6529
Oak Ridge, Tennessee (C)	3707	(a)	(a)
Oakland, California (A)	2702	2806	3002
Oklahoma City, Oklahoma (C)	3285	3403	3519
Omaha, Nebraska (A)	5436	6125	6155
Parkersburg, West Virginia (C)	4399	4403	4750
Peoria, Illinois (A)	5409	5768	6076
Philadelphia, Pennsylvania (C)	4045	4093	4523
Phoenix, Arizona (A)	1357	1285	1492
Pittsburgh, Pennsylvania (C)	4568	4536	5048
Pittsfield, Massachusetts (A)	(a)	6920	7606
Pocatello, Idaho (A)	6178	6659	6976
Portland, Maine (A)	7074	6830	7610
Portland, Oregon (C)	4020	3910	4116
Providence, Rhode Island (A)	5510	5047	6099
Pueblo, Colorado (A)	4698	5376	5709
Raleigh, North Carolina (A)	3004	2897	3075
Rapid City, South Dakota (A)	6379	6778	7479
Reading, Pennsylvania (C)	4524	2846	5055
Red Bluff, California (A)	2436	2552	2546
Reno, Nevada (A)	5486	5970	5948
Richmond, Virginia (A)	3630	3433	3955
Rochester, New York (A)	6245	6089	6820
Roswell, New Mexico (A)	3176	3333	3424
Sacramento, California (C)	2404	2460	2600
St. Joseph, Missouri (A)	4881	5364	4703
St. Louis, Missouri (C)	3929	4193	4469
Salt Lake City, Utah (A)	5140	5405	5866
San Antonio, Texas (A)	1380	1947	1579
San Diego, California (A)	1180	1348	1556
Sandusky, Ohio (C)	5159	5310	5859
San Francisco, California (C)	2560	2833	2703
Sault Ste. Marie, Michigan (A)	8616	8416	9240
Savannah, Georgia (A)	1716	1722	1710
Scranton, Pennsylvania (C)	5490	5481	6029
Seattle, Washington (C)	4352	4104	4344
Sheridan, Wyoming (A)	6954	6939	7835
Shreveport, Louisiana (A)	2056	2070	2117
Sioux City, Iowa (A)	6312	6985	6987
Spokane, Washington (A)	6388	6069	6807
Springfield, Illinois (A)	4686	4865	5225
Springfield, Missouri (A)	4145	4502	4685
Syracuse, New York (A)	6123	6040	6491
Tacoma, Washington (C)	(a)	(a)	4738
Terre Haute, Indiana (A)	4918	5081	5361
Toledo, Ohio (A)	5716	5789	6382
Topeka, Kansas (C)	4376	4848	4919
Trenton, New Jersey (C)	4538	4551	5068
Tulsa, Oklahoma (A)	3219	3536	3584
Utica, New York (O)	6586	6711	6796
Valentine, Nebraska (C)	6262	7050	7054
Walla Walla, Washington (C)	4458	4217	4848
Washington, D. C. (C)	3778	3755	4258
Wichita, Kansas (A)	4158	4474	4571
Williston, North Dakota (C)	8353	8380	8997
Winnemucca, Nevada (A)	5918	6363	6352
Yakima, Washington (A)	5725	5474	5838

(a) Data not available.

*Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

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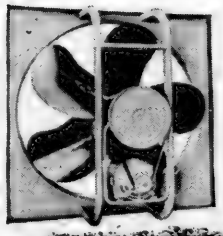

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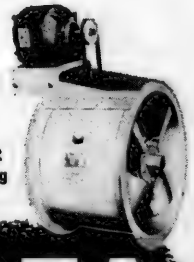

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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

CHEMICAL SOCIETY MEETING—126th national fall meeting of the American Chemical Society, in New York City. R. M. Warren, secretary of the Society, 1155 Sixteenth St. N.W., Wash. 6, D. C. . . . . **SEPTEMBER 12-17, 1954.**

INTERNATIONAL INSTRUMENT CONGRESS—First International Instrument Congress and Exposition, sponsored by The Instrument Society of America, to be held in the Commercial Museum and Convention Hall, Philadelphia, Pa. Richard Rimbach, managing director of the Exposition, 845 Ridge Ave., Pittsburgh 12, Pa. . . . . **SEPTEMBER 13-25, 1954.**

PLUMBING AND HEATING CONVENTION—Third annual convention of the American Institute of Wholesale Plumbing & Heating Supply Associations, at New Orleans, La. George T. Underwood, executive secretary, 402 Albee Bldg., Washington, D. C. . . . . **SEPTEMBER 19-22, 1954.**

AGA CONVENTION—Annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary of the Association, 420 Lexington Ave., New York, N. Y. . . . . **OCTOBER 11-13, 1954.**

ELECTRICAL ENGINEERS MEETING—Fall general meeting of the American Institute of Electrical Engineers, at the Hotel Morrison, Chicago, Ill. Secretary of the Institute, 33 West 39th St., New York 18, N. Y. . . . . **OCTOBER 11-15, 1954.**

SAFETY CONGRESS AND EXPOSITION—42nd National Safety Congress and exposition, of the National Safety Council, at Chicago, Ill. R. L. Forney general secretary of the Council, 425 No. Michigan Ave., Chicago 11, Ill. . . **OCTOBER 18-22, 1954.**

ASA CONFERENCE—Fifth national conference on Standards and 36th annual meeting of the American Standards Association, at the Roosevelt Hotel, New York, N. Y. Secretary of the Association, 70 East 45th St., New York 17, N. Y. . . . . **NOVEMBER 15-17, 1954.**

REFRIGERATION SERVICE ENGINEERS CONVENTION—17th Annual convention of the Refrigeration Service Engineers Society, at the Raddison Hotel, Minneapolis, Minn. Secretary of the Society, 2577 No. Teutonia Ave., Milwaukee 6, Wis. . . . . **NOVEMBER 18-21, 1954.**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at the Statler Hotel, New York City. Secretary of the Society, 29 W. 39th St., New York City. . . . . **NOVEMBER 28-DECEMBER 3, 1954.**

ASRE CONVENTION—50th Annual convention of the American Society of Refrigerating Engineers at the Benjamin Franklin Hotel, Philadelphia, Pa. Secretary of the Society, 234 Fifth Ave., New York City, N. Y. . . . . **NOVEMBER 28-DECEMBER 3, 1954**

POWER SHOW—21st National Exposition of Power and Mechanical Engineering, at the Comercial Museum, Philadelphia, Pa., to be held under the auspices of The American Society of Mechanical Engineers. Charles F. Roth, manager of the Exposition, 480 Lexington Ave., New York 17, N. Y. . . . . **DECEMBER 2-7, 1954.**

NATIONAL RETAIL INDUSTRY SHOW—First National Retail Industry Show of the Store Modernization Institute, combined with the 5th Store Modernization Show at Madison Square Garden, New York, N. Y. John W. H. Evans, secretary of the Institute and managing director of the Show, 20 E. 55th St. New York, N. Y. . . . . **JANUARY 7-11, 1955.**

SOLAR ENERGY SYMPOSIUM—A world symposium on applied solar energy, sponsored by Stanford Research Institute, Stanford, Calif. at the Westward Ho Hotel, Phoenix, Ariz. Chairman of the Institute, 612 S. Flower St., Room 332, Los Angeles 14, Calif. . . . . **JANUARY 12-15, 1955.**

HEATING & VENTILATING EXPOSITION—12th International Heating & Ventilating Exposition, at the Commercial Museum and Convention Hall, Philadelphia, Pa., held under the auspices of the American Society of Heating and Ventilating Engineers. Charles F. Roth, manager of the Exposition, 480 Lexington Ave., New York 17, N. Y. . . . . **JANUARY 24-28, 1955.**

LUBRICATION ENGINEERS MEETING—Annual meeting and exhibit of the American Society of Lubrication Engineers, at the Hotel Sherman, Chicago, Ill. Wm. P. Youngclaus, Jr., secretary of the Society, 84 E. Randolph St., Chicago 1, Ill. . . . . **APRIL 13-15, 1955.**

INTERNATIONAL CONGRESS OF REFRIGERATION—Ninth International Congress of Refrigeration, sponsored by the International Institute of Refrigeration, to be held in the conference rooms of the Sorbonne in Paris, France. General Secretariat of the Congress, International Institute of Refrigeration, 177, Boulevard Malesherbes, Paris, France . . . . . **AUGUST 31-SEPTEMBER 15, 1955.**

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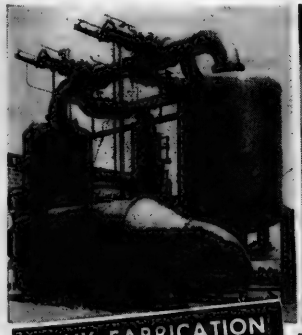

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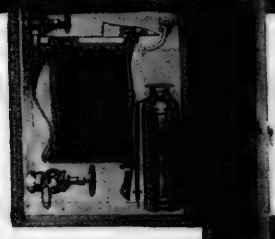

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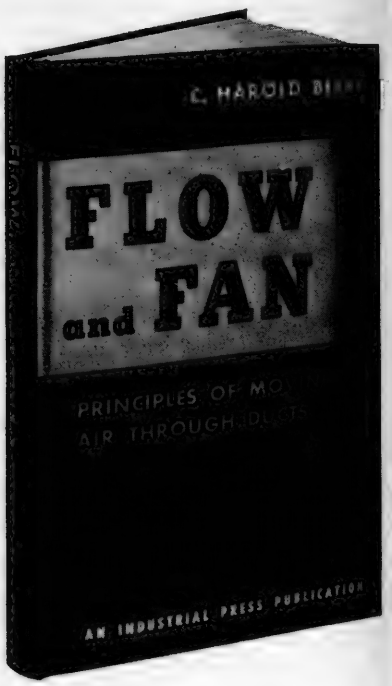

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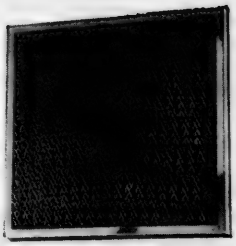

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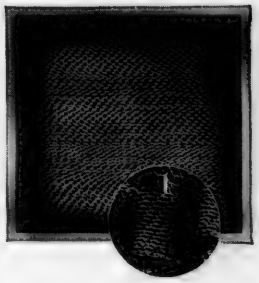

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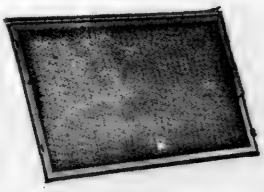

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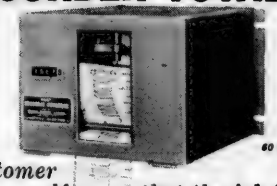

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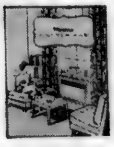

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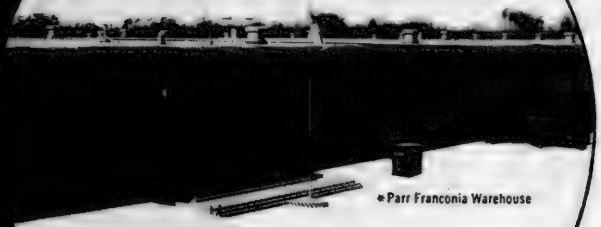

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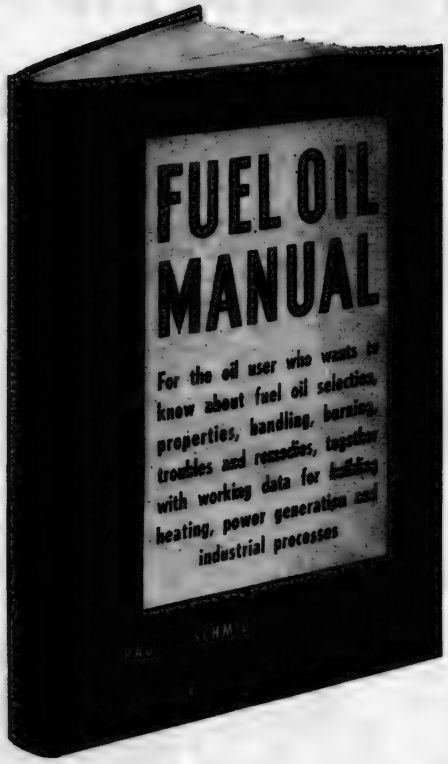
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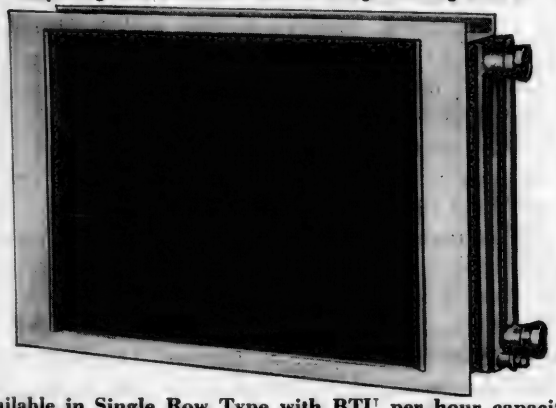

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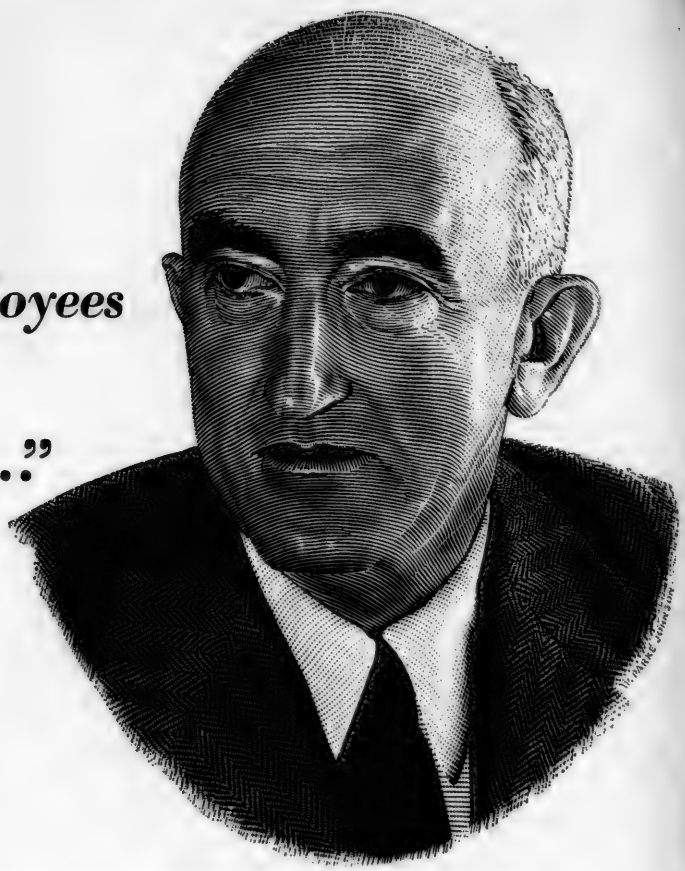

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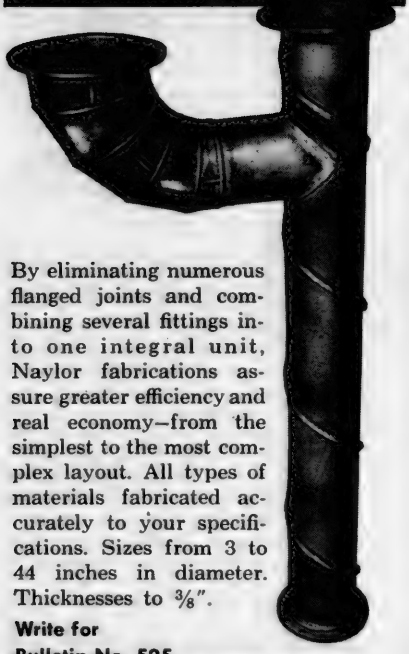

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TING

WEIGHTS OF GALVANIZED STEEL DUCTS — 46 × 46 TO 60 × 60 IN.

Gage	Weight of Galvanized Steel Duct per Lineal Foot																	Gage
16	42.98	43.43	43.88	44.33	44.78	45.23	45.68	46.13	46.58	47.03	47.48	47.93	48.38	49.05	49.50			16
18	35.02	35.38	35.75	36.12	36.48	36.85	37.22	37.58	37.95	38.32	38.68	39.05	39.42	39.97	40.33			18
20	27.06	27.34	27.63	27.91	28.19	28.48	28.76	29.04	29.33	29.61	29.89	30.18	30.46	30.88	31.17			20
22	22.30	22.51	22.75	23.00	23.22	23.45	23.70	23.92	24.15	24.38	24.60	24.85	25.10	25.44	25.65			22
24	19.10	19.30	19.50	19.70	19.90	20.10	20.30	20.50	20.70	20.90	21.10	21.30	21.50	21.80	22.00			24
26	14.33	14.47	14.63	14.78	14.92	15.08	15.24	15.37	15.53	15.68	15.82	15.98	16.13	16.35	16.50			26

Width of Duct, Inches	Square Feet of Duct Surface per Lineal Foot of Duct																	Width of Duct, Inches
	15.33	15.50	15.67	15.83	16.00	16.17	16.33	16.50	16.67	16.83	17.00	17.17	17.33	17.50	17.67			
	Height of Duct, Inches																	
46	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			46
47	60	46	47	48	49	50	51	52	53	54	55	56	57	58	59			47
48	59	60	46	47	48	49	50	51	52	53	54	55	56	57	58			48
49	58	59	60	46	47	48	49	50	51	52	53	54	55	56	57			49
50	57	58	59	60	46	47	48	49	50	51	52	53	54	55	56			50
51	56	57	58	59	60	46	47	48	49	50	51	52	53	54	55			51
52	55	56	57	58	59	60	46	47	48	49	50	51	52	53	54			52
53	54	55	56	57	58	59	60	46	47	48	49	50	51	52	53			53
54	53	54	55	56	57	58	59	60	46	47	48	49	50	51	52			54
55	52	53	54	55	56	57	58	59	60	46	47	48	49	50	51			55
56	51	52	53	54	55	56	57	58	59	60	46	47	48	49	50			56
57	50	51	52	53	54	55	56	57	58	59	60	46	47	48	49			57
58	49	50	51	52	53	54	55	56	57	58	59	60	46	47	48			58
59	48	49	50	51	52	53	54	55	56	57	58	59	60	46	47			59
60	47	48	49	50	51	52	53	54	55	56	57	58	59	60	46			60

Gage	Square Feet of Duct Surface per Lineal Foot of Duct																	Gage
	17.83	18.00	18.17	18.33	18.50	18.67	18.83	19.00	19.17	19.33	19.50	19.67	19.83	20.00				
	Weight of Galvanized Steel Duct per Lineal Foot																	
26	16.65	16.80	16.95	17.10	17.25	17.40	17.55	17.70	17.85	18.00	18.15	18.30	18.45	18.68				26
24	22.20	22.40	22.60	22.80	23.00	23.20	23.40	23.60	23.80	24.00	24.20	24.40	24.60	24.90				24
22	25.90	26.15	26.36	26.60	26.82	27.05	27.30	27.52	27.77	28.00	34.28	28.45	28.70	29.05				22
20	31.45	31.73	32.02	32.30	32.58	32.87	33.15	33.43	33.72	34.00	34.28	34.57	34.85	35.28				20
18	40.70	41.07	41.43	41.80	42.17	42.53	42.90	43.27	43.63	44.00	44.37	44.75	45.10	45.65				18
16	49.95	50.40	50.85	51.30	51.75	52.20	52.65	53.10	53.55	54.00	54.45	54.90	55.35	56.03				16

ESTIMATING WEIGHT OF METAL IN CIRCULAR DUCTS

The accompanying table is for use in determining the weight of galvanized steel sheet metal used in fabricating ducts of circular cross section. Also included are data on the surface area of circular ducts for use in estimating insulation areas.

Recommended gages for circular ducts for heating and general ventilating work are:

Diameter, Inches	Gage
6 to 19	26
20 to 29	24
30 to 39	22
40 to 49	20
over 49	18

For industrial exhaust systems the following represents good practice:

Diameter, Inches	Gage
Under 9	24
9 to 14	22
15 to 20	20
21 to 30	18
over 30	16

The weights given in the table include allowance for seams on the basis that the ducts are cut from sheets 30 in. wide, and that one lap of 1 inch is required for each sheet. Thus, ducts up to 9 inches diameter contain one lap and so on up to ducts of 72 inches diameter which contain 8 laps. No allowance is made for waste, bracing or hanging.

Areas and Weights of Circular Galvanized Steel Ducts

Diameter, In.	Area per Ft., Sq.Ft.	Gage 26	Gage 24	Gage 22
		Weight per Ft., Lb.		
4	1.05	1.02	1.36	1.59
5	1.31	1.25	1.67	1.95
6	1.57	1.49	1.98	2.32
7	1.83	1.72	2.30	2.69
8	2.09	1.96	2.61	3.06
9	2.36	2.20	2.93	3.42
10	2.62	2.51	3.34	3.91
11	2.88	2.74	3.66	4.28
12	3.14	2.98	3.97	4.64
13	3.40	3.21	4.28	5.01
14	3.67	3.45	4.60	5.38
15	3.93	3.68	4.91	5.75
16	4.19	3.92	5.23	6.12
17	4.45	4.16	5.54	6.48
18	4.72	4.39	5.85	6.85
19	4.98	4.63	6.17	7.22
20	5.24	4.94	6.58	7.70
21	5.50	5.18	6.90	8.07
22	5.76	5.41	7.21	8.44
23	6.02	5.64	7.53	8.80
24	6.28	5.88	7.84	9.17
25	6.54	6.12	8.15	9.54
26	6.80	6.35	8.47	9.91

Diameter, In.	Area per Ft., Sq.Ft.	Gage 24	Gage 22	Gage 20	Gage 18
		Weight per Ft., Lb.			
27	7.07	8.78	10.27	12.47	16.07
28	7.33	9.10	10.64	12.92	16.65
29	7.59	9.41	11.01	13.36	17.22
30	7.85	9.83	11.50	13.95	17.98
31	8.11	10.14	11.86	14.40	18.55
32	8.38	10.45	12.23	14.84	19.13
33	8.65	10.77	12.60	15.29	19.70
34	8.91	11.08	12.96	15.74	20.28
35	9.17	11.40	13.33	16.18	20.85
36	9.43	11.71	13.70	16.63	21.43
37	9.69	12.02	14.07	17.07	22.00
38	9.95	12.34	14.44	17.52	22.58
39	10.21	12.65	14.80	17.97	23.15
40	10.47	13.07	15.29	18.55	23.91
41	10.73	13.39	15.66	19.00	24.49
42	10.99	13.70	16.02	19.45	25.06
43	11.26	14.01	16.39	19.89	25.64
44	11.52	14.32	16.76	20.34	26.21
45	11.78	14.64	17.13	20.78	26.79
46	12.04	14.95	17.49	21.23	27.36
47	12.30	15.27	17.86	21.68	27.94
48	12.56	15.58	18.23	22.12	28.51
49	12.83	15.89	18.60	22.57	29.09

Diameter, In.	Area per Ft., Sq.Ft.	Gage 20	Gage 18	Gage 16
		Weight per Ft., Lb.		
50	13.09	23.16	29.84	36.69
51	13.35	23.60	30.42	37.40
52	13.61	24.05	30.99	38.11
53	13.87	24.50	31.57	38.81
54	14.13	24.94	32.14	39.52
55	14.39	25.39	32.72	40.23
56	14.65	25.83	33.29	40.93
57	14.92	26.28	33.87	41.64
58	15.19	26.73	34.44	42.35
59	15.45	27.17	35.02	43.05
60	15.71	27.76	35.78	43.99
61	15.97	28.21	36.35	44.69
62	16.23	28.65	36.93	45.40
63	16.50	29.10	37.50	46.11
64	16.76	29.54	38.07	46.81
65	17.02	29.99	38.65	47.52
66	17.29	30.44	39.23	48.23
67	17.55	30.88	39.80	48.94
68	17.81	31.33	40.38	49.64
69	18.07	31.78	40.95	50.35
70	18.33	32.36	41.71	51.28
71	18.60	32.81	42.28	51.99
72	18.86	33.26	42.86	52.70

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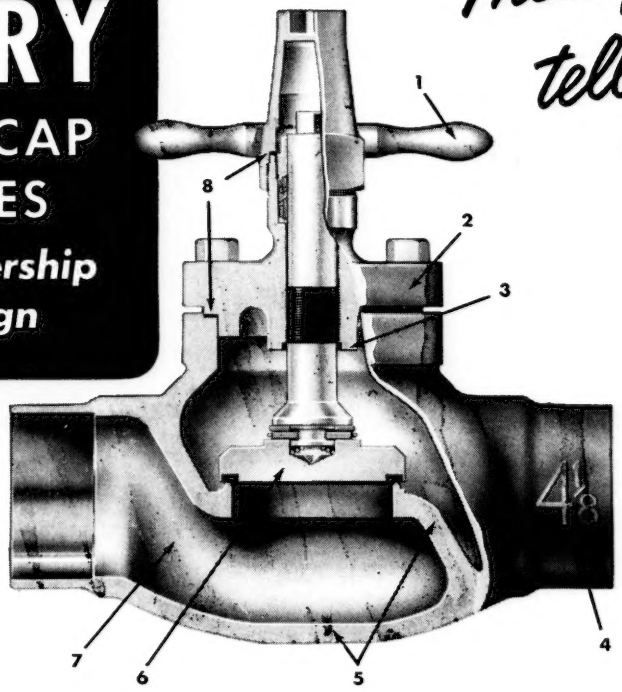

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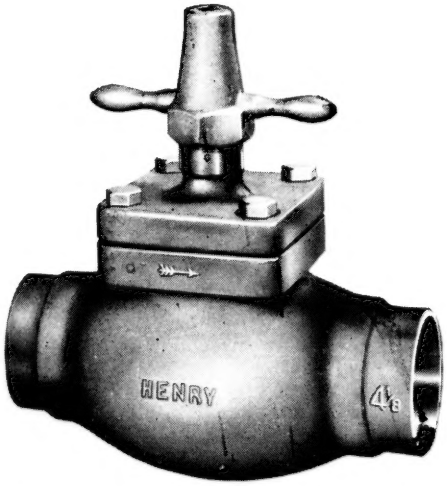

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